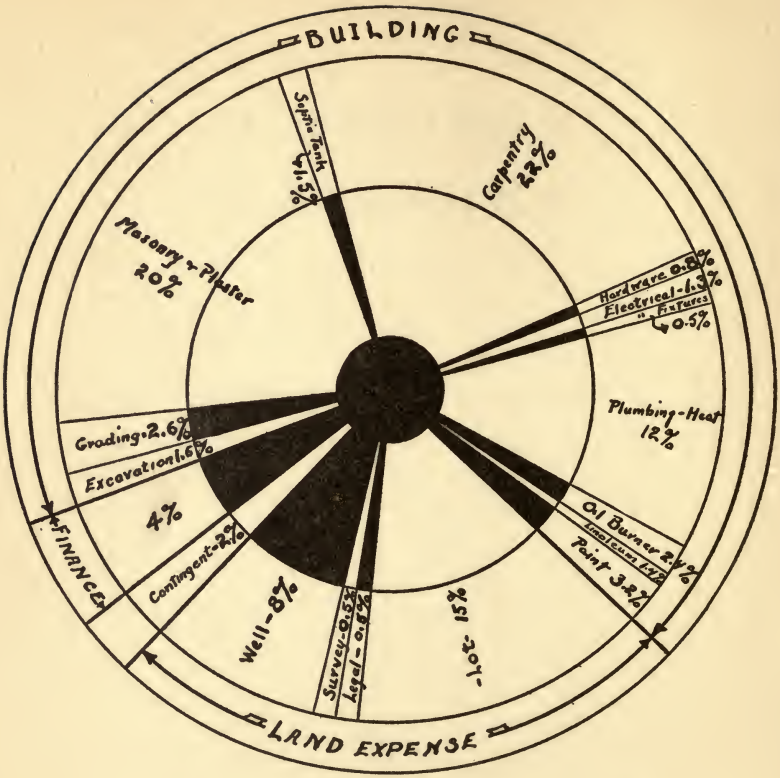
From the collection of the

San Francisco, California
2006

WITHOUT BENEFIT OF ARCHITECT

By the Same Author

HOUSES OF STONE



THE BALANCED DOLLAR IN A MASONRY HOUSE

Balance in the building budget is a prime requisite for the home owner's investment.

WITHOUT BENEFIT OF ARCHITECT

By

FRAZIER FORMAN PETERS

G·P·PUTNAM'S SONS
New York

COPYRIGHT, 1937, BY

FRAZIER FORMAN PETERS

All rights reserved. This book, or parts thereof, must not be reproduced in any form without permission.

PRINTED IN THE UNITED STATES OF AMERICA

TO

THOSE WHO SUFFERED

WHILE I LEARNED

CONTENTS

	Introduction	xiii
I.	The Aiming Point	1
II.	Personal Budget or How Much Can I Spend?	4
III.	Mortgages—Source and Amount	6
IV.	Remodeling—Profitable or Otherwise	11
V.	Pre-fabricated Houses—The Great Question Mark	14
VI.	Land—Where Should I Buy?	17
VII.	The Purchase Contract—What Should It Include?	22
VIII.	Public Utilities and Their Extension	26
IX.	The Well	29
X.	Pumps	34
XI.	The Septic Tank—What Makes the Wheels Go Round?	39
XII.	Plans—How Shall I Get and Use Them?	48
XIII.	Contractors—One or Many?	52

XIV. The Building Contract—Its Form and What It Should Include 57

XV. Contract—Payments 60

XVI. Liens—What Manner of Fish and How Can They Be Avoided? 62

XVII. The Building Inspector as a Helpmate 65

XVIII. Grading and Planting—How Much Is Necessary? 67

XIX. Cellar—How Much? 69

XX. Cellar—Of What Should It Be Built? 71

XXI. The Outside Frame—What Material? 73

XXII. The Relative Costs of Materials for the Outside Shell 77

XXIII. Masonry—Short Cuts in Its Supervision 80

XXIV. Fireplaces and Chimneys 82

XXV. Masonry Floor Coverings—Inside and Outside 85

XXVI. Carpentry—The Wood Frame 87

XXVII. Carpentry—Exterior Trim 90

XXVIII. Roofs—What Material and Relative Costs 92

XXIX. Insulation—The Various Types and Their Uses 97

XXX. Termites 102

XXXI. Windows—Steel and Wood 104

XXXII. Carpentry—General Interior Trim 106

XXXIII. Carpentry Accessories: Bookcases, Corner Cabinets, and Mantels 112

XXXIV. Kitchen Cabinets 113

XXXV. Floor Coverings—Carpet; Linoleum; Tile—Rubber, Asphalt, or Clay; Wood—Pine, Oak, or Fir 115

XXXVI. Sound Deadening 121

XXXVII. Hardware—Rough and Ready or Fancy 124

XXXVIII. Plaster and Plaster Base 127

XXXIX. Bathroom and Kitchen Wall Coverings 132

XL. Electrical 137

XLI. Paint and Paper 141

XLII. Plumbing and Plumbing Fixtures 147

XLIII. Sheet Metal 150

XLIV. Summer Air-Conditioning—When? 152

XLV. Winter Air-Conditioning—Of What Does It Consist? 154

XLVI. Heating Systems—A General Discussion of the Modern Improvements in All Three Types: Hot Air, Steam, and Hot Water 157

XLVII. The Heating Plant—The Final Selection 166
XLVIII. What Fuel? 169
XLIX. Oil Burners—What Make? 172
L. Domestic Hot Water Supply 174
LI. The Budget or What Is a Balanced Ration? 177
LII. A Check List for Preparing a Specification—Lest We Forget 181
LIII. Ship Ahoy or What Should You Do to Keep It Afloat? 194
LIV. The Dark Horses of the Future—Steel and Concrete 198
LV. The House of the Future 201
LVI. In Conclusion 204
Index 207

INTRODUCTION

I DON'T PLAY GOLF but if I did—had just made a beautiful drive down the fairway only to have some one say, "But he had his handkerchief in his left pocket," I know how I'd feel.

I can't bake but if I could—had just perfected a luscious chocolate layer cake and some one criticized it on account of the color of the oven, I know what I should want done with him.

Well, I do build houses and I feel exactly that way when a layman comes along and says, "Has it brass pipe?"—"Is it air-conditioned?"—"Is it insulated?"

It is then that I sympathize with the builder who buys one bag of mineral wool, puts a little here and there so that he can actually demonstrate that his building is insulated by exhibiting a bit.

During the next few years, hundreds of thousands of Americans are going to buy or build homes without the aid or counsel of an architect—"without benefit of architect." Armed with a few *minor facts* gleaned from not over-honest nor disinterested advertisements, they are going to appraise their intended purchases or write a specification and contract.

Armed with top-heavy information, they are going

to buy a top-heavy house; it may have no foundation, or be nailed on every fifth stud, but it will have brass pipe, insulation, and an air-conditioning system of sorts.

At college my fraternity, after long years of study, developed a most effective system of getting its members through courses.

We had a catalog of the various professors' idiosyncrasies. One professor, for instance, in eight examinations out of ten, required the students to develop the formula of a Cippoletti Weir. Given about fifteen more such tips, almost any student could rate "B" by knowing only sixteen out of the hundreds of problems. It became a guessing game—not a course of study at all.

And so home building has degenerated—not due to the builder so much as to the owner. Why should a speculator build diaphragmed cellars if three dollars' worth of copper around the chimney will give him a perfect rating? Why should he spend an extra hundred dollars on a free standing masonry shell when fifteen dollars spent on linoleum counters in the kitchen will put the name on the dotted line more quickly?

Why should he bother with better building when the game after all is nothing more than a matter of guessing "What will take your eye"?

As I look back at our game in college, it was harmless. The course was pure theory, whereas our system, though deplorable, at least taught practicality.

But the same system, when applied to buying a house, is dangerous to the buyer, and the only way to correct or counteract the system is by an intelligent analysis of

all, not just a few, of the parts that go to make up a good building.

That is the purpose of this book—it does not aim to replace or eliminate the architect—it merely hopes to serve as a Prayer Book to those who for one reason or another have to buy or build "without benefit of architect."

CHAPTER I

THE AIMING POINT

About two per cent of our American people acquire their homes with the assistance of an architect—the other ninety-eight per cent acquire them either as antiquated "hand-me-downs" or as speculative houses or by building for themselves from stock plans with a contractor or hired help.

In all of these, there is likely to be a lack of one element easily enough acquired, but which if neglected, unquestionably will spell ruin to the whole building venture. For which, God be praised!

Twenty years ago, doctors were unanimous in the opinion that one day man's life would be extended indefinitely by a few, well-directed pills and gland extracts. Today, though, they realize that health and even life itself is dependent not upon the strength of blood and bones but upon the mental attitude—or shall we say *spirit*—which makes of those blood and bones a human, good or bad.

Laymen and many architects, I believe, make the same error as the old doctors. They lay too much stress upon strong timbers, indestructible roofs, waterproof cellars, forgetting that many times death comes to

buildings not as the result of a weak body, but for lack of a spirit.

Tomorrow and the day after, our homes are going to face a new era in building, they not only will have others of their kind to compete with, but they will have as well factory-built competitors with and without wheels.

Homes bought today will have to battle for life with houses of enameled iron and rustless steel, cut and assembled with precision by the engineers. Strangely enough, these buildings will be better able to withstand the ages than the architect's house. They will be so lacking in spirit, though, that their very designers will write their death warrant at the christening by starting work on the next year's model.

I am no bigot—I recognize no man-named organization as representing the deity or the people's opinion, neither do I think that any group large or small has a corner on art—charm—individuality—or whatever you wish to call it.

I admire many great works of beauty executed by engineers and dislike numerous supposedly attractive buildings designed by architects. I admit that the days of the architect in large works rightfully are numbered and yet I firmly believe that the architect is doubly important in the design of small houses because it is the architect, not the engineer with his improved "noiseless second gear" toilets this year and his "super-charged" oil burners next, who is interested in the small, delicate, "hand-woven" building so necessary to suit our individual needs.

The speculative builder, the contractor, and the engineer are able to build as well or better than an architect—if they will—but few of them are able or discerning enough to meet your spiritual needs. To them, a building is composed of a furnace, some copper, and electric outlets. To the architect, it is the same—plus something else which I call charm. It is this charm which you must provide if you expect to preserve your investment and your home—and build or buy without an architect.

If you look at old houses, speculative houses, or lots and plan books, make no compromises and do nothing unless you "fall like a ton of brick."

Don't worry about "artistic-ness"; don't worry about whether the house or the plan will suit "Mrs. Jones." Instead, be sure that it suits you and that you will make of it a home.

That accomplished, look after the details of construction and finance. In fact, having gained the spirit, there is reason in good and everlasting construction.

CHAPTER II

PERSONAL BUDGET
OR
HOW MUCH CAN I SPEND?

In all my experience I am sure that I have never met my equal for "having done that which I ought not to have done."

I not only have built on shoe-strings and gotten by on the skin of my teeth but I also have sat upon the lonely raft in a sea of troubles of my own making.

My advice is akin to that given by those other experienced sinners at Salvation Army meetings. Better still, it is leavened with the observations gleaned from some one hundred and fifty to two hundred others for whom I have built—some sinners and some saints.

Much of this advice is pure dogma—as unreasonable, debatable, and illogical as the command not to covet one's neighbor's ox. Given time, I could support my conclusions with actual cases. Here, though, you must be content with my statement. To dispute it is your prerogative, but if you do, I am released—free, of course, to say, "I told you so."

First of these dogmatic rules: Do not put a home on

land costing more or less than one quarter of the cost of the house.

Buy a tract of land, let us say, costing $10,000.00. Build a house upon it costing an equal amount. The whole is unbalanced. Mortgage it as a unit and you may lose all.

If you must have this land and will not be content with less, divide it into two tracts. On one quarter of it, put your house and its mortgage. Treat the remaining part as a separate investment.

When hard times come and ballast must be dropped to stay afloat, you will find either or both can be disposed of profitably, whereas, bound together, with money tight, it may be impossible to separate them.

On the other side of the fence, of course, is the man who puts a $10,000.00 house on a $1,000.00 plot. For him, there is no help except that the value of his land may increase to $2,500.00. If you like to gamble, try it —if you have a poker face.

So much for relative expenditures. Next comes the question, "How much can one afford to spend for the whole—land and building?" Two and one half times the earned income, and by earned I mean *earned*—legacies, bonuses, and other gratuities that may stop just when you most need them are excepted.

Follow these two rules—follow them because if they err, they err on the side of caution and not into the hands of short selling profiteers.

CHAPTER III

MORTGAGES—SOURCE AND AMOUNT

Pretty circulars by the F.H.A., savings banks, and other institutions notwithstanding, the man of today with no money and no home will find the mortgage market is just as pious as it was in 1930 and that it still adheres to the old Christian principle "Unto him that hath shall be given—from him that hath not even that which he hath not shall be taken."

Despite press notices to the contrary, interest rates still stand at 1931 levels unless the amount needed is proportionately low.

Bonuses and brokerage charges are not extinct. The countless brokers seeking your business are mute evidence to this fact—(brokers are not free love addicts, you know)—the charge is paid by you not frankly as a brokerage fee according to the 1930 rules but as interest and an appraisal fee.

Most people believe that the Federal Housing Act contained provisions which magically made it possible for them to build in 1936 whereas this was impossible in 1934—difficult, even in 1930.

As a matter of fact, though, the F.H.A. only aided the Home Owner of 1936 indirectly by giving backbone

and strength to timid bankers about two years before they normally would have recovered from their shock of 1929.

Nineteen thirty seven probably will see them brave and strong, able once again to sit up straight without the degrading assurance and insurance of the F.H.A.

An expectant borrower under F.H.A., you must understand that this authority does not make any direct or indirect loans to individuals. It is merely a governmental mortgage insurance company and deals only with banks and building loan associations.

Under its provisions certain banks and loaning institutions may apply to it in advance for insurance on loans they intend to make on homes to be constructed or on new homes that have been completed. The bank loans the money and the F.H.A., for a consideration, endorses the note.

What actually happens is this: you apply to your local banker for a loan. If the amount you desire is less than fifty per cent of the value of the house and land, he probably will bear the risk himself. If, however, you want an eighty per cent loan, he will insist upon its being guaranteed by the F.H.A.

The routine is extremely simple. Take three sets of the plans and specifications for your house and three plot maps to your local banker. Pay him the usual appraisal fee of three dollars a thousand; fill out the application form; and wait to see what happens.

If your decision to build or not to build is dependent upon the granting of the loan, the application can be filed even though you do not own the land. The appli-

cation is regarded as exploratory. The mortgage need not be accepted if for any reason you are not satisfied or willing to accept.

Prior to 1931, practically all mortgages were written for what was known as a term; i.e., the mortgage was written to mature three or five years from the day it was written. That was the period when bankers expected us all to be rich on the morrow. Today they expect us all to be poor ad infinitum. So mortgages today are written on a "pay as you go" basis; i.e., the loan is written for a term of from twelve to twenty years with equal monthly payments sufficient to pay the interest and automatically repay the principal during that time.

This principle is not peculiar to F.H.A. loans but holds true on practically any mortgage made today, whether through a bank, a building and loan association, an insurance company, or a private individual.

This practice of reducing the principal is sound and should serve to give a continual supply of money for new construction and at the same time give added solidity and strength to our banks.

Of course before filing your mortgage application, you yourself must have a complete understanding of just what you aim to do, exactly how much money you will need to do it, how that money is to be raised, and how repaid.

Perforce then you must have settled, at least tentatively, upon a certain tract of land and upon one definite house plan. In addition you must have obtained a bid on the cost of the whole and worked out a simple

budget of credits and debits, of cost versus cash on hand and cash necessary to be raised by mortgage.

Where you had best file your application, the probable interest rate, etc., as I have explained, depend largely upon what percentage loan you desire and to some extent upon what your gross requirements are.

The cheapest and most plentiful source of mortgage money, today and always, is of course the large insurance companies. Each of them maintains throughout the world agents, brokers, and offices whose only duty is to seek homes and make a deal with the owner.

They offer interest rates as low as four and one-half per cent without any insurance charges and with or without complete amortization of the principal. They either pay the broker in part or in full and lack in popularity merely because under no conditions will they loan more than sixty per cent of the total value of the property.

The next cheapest source of money is through building loan associations without the F.H.A. guarantee. These loans usually can be had on a five and one-half per cent basis but are limited to seventy per cent of the value of the property.

Requiring more than either of these agencies would grant, you have no alternative but filing through a bank or a building loan association under the F.H.A. guarantee. In this way a loan of eighty per cent can be obtained which should be enough to pay all costs provided you own the land and it is worth, as it should be, one quarter of what you intend to spend on the building.

You will have no difficulty in locating all these various agencies in your locality. They are in a highly competitive business and you probably will find them advertising in the daily papers. But if not, look in your classified telephone directory under "Mortgages."

And now for a word of caution. No matter how cheap money is, no matter how much you are offered, and no matter how reasonable it may seem to put in that extra bath now, control yourself!

To be a home, this thing you are building must have dignity and poise in your mind. Proportion it architecturally as you will, still if it is top heavy financially—forever toppling in your mind amid a wild succession of monthly payments—then all the thought and effort has been in vain. It would be best if it did fall—had been still born—at least then you would be free—wiser but unfettered.

CHAPTER IV

REMODELING—PROFITABLE OR OTHERWISE

You, no doubt, have stopped along the road en route to an important engagement to tend an injured dog—its suffering could not be passed by silently, no matter what the loss.

In a like manner, some people find it very difficult to pass up an old farmhouse dying by degrees on its feet.

I respect the spirit which prompts this feeling. I cannot, however, fail to remind you that Good Samaritans are rewarded in heaven, not on earth.

In my humble opinion—and I have done a large amount of it—remodeling is never profitable in the sense that ten dollars' worth of material bought for five is returned to its original value. In fact, remodeling is justifiable only under two conditions: first, when you happen to own the land on which the building exists and have to choose between cost of demolition or cost of rehabilitation; or second, when the spirit of the building is not weak even though the body is "failin'."

If you do not believe me and are tempted to buy an old shack that needs a little "fixing," bear in mind the following facts: first, the shell of a building (i.e., the side walls plus the roof, plus the cellar, plus the floor

timbers, plus the windows, plus the rough partitions, and plus the rough floors) represents only one third of the total cost of a building; second, items of lumber and trim in an old building are more than worthless unless you use them in their existing locations.

The business of remodeling reminds me of the magicians' trick, "Now you have it—now you haven't."

You buy a perfectly nice house with doors, windows, and plaster, but lacking heat, electricity, and plumbing.

First thing you know, you have no plaster—because of the cutting by the plumber and electrician.

Second, several doors and windows have to be shifted to accommodate the new baths, kitchen, and pantry; and that means extensive alterations to the exterior and interior frames and necessitates repainting, re-siding, and more plastering, all of which amounts to more than the value of all the doors and windows.

Last winter I performed ten major operations on buildings which ran the gamut in original finish from the mere shell of a pigeon house to a barn with paneled harness rooms. All were converted into modern four- and five-room cottages.

When they were completed, the owner and I counted our costs and estimated our gains. To our surprise, the pigeon house was the only one of the lot to show a profit. The reason was simple enough: a mere shell to start with, the pigeon house alteration was not a remodeling job at all; it was new construction. The other buildings involved us in just as much new work, and in addition, required a large amount of ripping and cut-

ting to reduce them to the docile state of the pigeon house.

In this experience, you have the secret of successful remodeling. It is not a question of what a building contains originally—but rather how much of the original building can be used "as is." The problem is not "can a building be remodeled to fit one's needs with a minimum of changes," but rather, "can *you* fit the building without a lot of destructive relocation and cutting."

And finally, if you don't follow my advice, tell me when the remodeling is all over whether Burns wasn't about right when he wrote,

"The best laid schemes o' mice an' men,
Gang aft a-gley,
An' lea'e us nought but grief and pain
For promis'd joy."

CHAPTER V

PRE-FABRICATED HOUSES—THE GREAT QUESTION MARK

For some little time now builders of pre-fabricated homes have been threatening to start the show. From day to day, though, we get nothing but postponements until finally even the uninitiated must wonder what the trouble is.

The trouble is simply that it takes a bride and a groom to make a wedding. The officials are prepared. The audience are in their seats with pockets full of rice and old shoes. The organ is playing sweet tunes of bliss. But no one steps forward to be the "goat."

And yet even while they sit and wait, the pre-fabricated house of the future rolls by unrecognized—the trailer.

Automobiles and trailers seem cheap to most of us when compared with the cost of ordinary houses.

But how about it? Automobiles cost four dollars a cubic foot; trailers, almost two dollars, while homes with as much machinery and thousands more parts, cost at most fifty cents a cubic foot.

The answer then is not mass production.

Have you investigated pre-fabricated buildings? Have

you talked to owners who have lived in them for any length of time? And have you compared them foot by foot with the common every-day garden variety of house that you and I are used to?

If you have, you found out first that they are convenient, well arranged, and compact, that they are better built than most houses, of more expensive materials, more expensively produced. But you also have found that they are small in over-all dimensions and small in their individual appointments, from the kitchen to the hall closet.

And they are small because they are built of expensive materials which must be used sparingly.

The trailer "makes no bones" about size, in fact capitalizes on the fact that one can spit or sweep from stem to stern in one gesture. Trailer fans glory in the fact that they have evolved a new life, a life in which radio, frying pan, and bed have been indissolubly wedded.

The pre-fabricated people, though, have evolved no new life to go with their sardine cans. They depend for success or failure on price and price alone. And to date, their failure is attributable solely to the fact that their houses are too well built, too costly per cubic foot, and so do not attract those of us who are used to space and who prefer space to meaningless gadgets that add as much to one end of our day as they save on the other.

But it is coming, this exciting life of being a sardine, and some day the pre-fabricated house, a wheel-less trailer, with all its expensive fixings, at the cost of space, will be accepted. Necessity will push the bride and groom forward—necessity plus lessons in the new mode

of life learned painfully from the nomadic pioneers of today.

But until you and I have learned to sleep in comfort without room to turn, until then, the pre-fabricated house is not for us—because though it may be cheap in over-all cost, it, of necessity, is not and never will be a cheap method of producing space—space so necessary to those of us who have become used to a decent amount of privacy in our living and in our thought.

CHAPTER VI

LAND—WHERE SHOULD I BUY?

THE old saying "charity begins at home" is all right to a certain point, but when the charity not only begins at but includes the home itself—well, enough is enough.

Have you ever wondered how the other half lives? what they live in?

Statistics tell us that ninety-five per cent of our population cannot afford to support a home costing more than $3500. Builders tell us that new houses cannot be built for so little money. Yet the market is glutted with houses for rent at prices that indicate a value of less than $3500. Are the statisticians, the builders, or both, liars? Neither.

These people—ninety-five per cent of our population —are housed in the mistakes of the so-called more intelligent upper five per cent. Look about you at the Victorian houses with their pergolas and heavily festooned copings. Who lives in them now? The heirs of the aristocracy who built them?—or are they now two-family houses, occupied perhaps by a grocery clerk, his unmarried daughter, and his wife?

How about those other houses along Main Street with their front porches overlooking the forgotten trolley

tracks? Has the first floor taken in a dry cleaning establishment, the second been converted into a small apartment—or is it still occupied by the prosperous commuter who built it?

But wait—don't go as far back as that. Five years ago, where was it they were building houses so fast—so close together? What did they cost? What are they worth today? Less? Why? Building costs are lower now than then.

Banks never have been willing to grant mortgages for more than fifty per cent of the value of a building. Building costs go up. Building costs go down, but never more than thirty per cent. Then why are wailing bankers, like the poor, always with us? A building's value is not hard to figure: the price of bricks and mortar is no secret. Where is the hitch? Why should ninety-five per cent of our buildings lose thirty, forty, fifty, or eighty per cent of their original value in a matter of five, ten, or twenty years?

Is it poor construction—do they crack and threaten to fall down? Yes, sometimes they do crack and almost fall down, are bought at a premium, repaired, and sold at a profit.

Good construction—bad construction have nothing to do with it.

Bad architecture? Good architecture? It may help. You and I know of houses, dignified little houses, in Boston, Oshkosh, or Peru, wedged in between hard-looking characters, still there, still whole, still loved. They remind one of a lone rose persisting in a garden

of weeds. Architectural straightforward simplicity helps —but alone it cannot win. The battle is too tough.

What is it then that causes this tremendous national loss?

Lack of foresight. Nothing more.

The world is moving on—cities are growing and we are being washed ahead of them like pebbles before an uncharted freshet. Today we take a stand in one place only to find ourselves swamped tomorrow by a new wave of Italians, Greeks, noisy trucks, or taxis.

We buy and build a home in one spot today, only to find tomorrow that it somehow is lacking in a quality we all expect in a home—peace. On paper, it should be ideal. In the flesh, life with it becomes boring and as futureless as planned economy and loveless marriages are wont to be.

Today the spirit of revolt is among all of us. Kings demand freedom and the right to live as they will—and the right of the common man to a "better life" has become a political slogan—a natural "go getter" so far as votes are concerned.

Apartment dwellers find stuffy flats too confining, move to the suburbs. Suburbanites find their homes sadly lacking, move to the country.

The whole movement is a revolt against a life that made man live in compartments numbered and placed one upon another like letter boxes or in houses neatly arranged in squares like the stalls in a firehouse. The revolt is against regimentation and has as its chief ally, strangely enough, the motor car, that most regimented of all American industrial products.

Buy a 70x100 foot lot—but if you must build upon it and want your building to survive the flood, build something on wheels that can be dragged along when you move on five years later.

If the country frightens you, and if you must become used to it by degrees, buy a temporary place in the suburbs, but sell it before this movement has spent itself because man's natural craving, plus television, the airplane, and the motor car, some day are going to make our suburban developments look like a florist's seed beds when all the plants finally have been shifted to the open fields.

Up to this point, it would appear that the size of the plot is the controlling factor. Avoid 70x100 foot plots; buy acreage, five, ten, or even twenty acres, and you will be safe.

Acreage helps—but acreage is not the whole cure. I can show you plenty of homes built upon plots miles square—yet they lack that something that makes them priceless to man. Likewise I can show you houses built on smaller tracts that could be sold at a profit any time.

The land, the house, are above ground but the cause for the difference between these places lies in the roots.

Man is essentially a lover of dirt—he likes to see it ooze between his toes and he likes to lie and roll in it once in a while. (Individuals may deny this, but it is true.)

All men at heart are producers—they may trade in stocks or write briefs in order to eat, but fundamentally their aim is to make something from nothing. The most soul-satisfying something to be made from nothing, next

to our own children, is a garden, a patch of fertile soil or a perfect tomato.

Some of us don't find this out for a long time. We move here and there seeking this and that—are unstable. Others, even though they live of necessity in "two by four" flats, find it out and fill their windows with pots and pans of seedlings.

But soon these lovers of the soil will be freed and the others will be educated through the primary class in our suburbs.

All will move eventually to places where they can produce and grow things not for the market but for the soul. For this, area is not necessary—acreage unessential.

Real estate operators are unanimous in stating that stability is essential to a safe real estate investment. Stability in the surroundings and in the people occupying the surroundings.

I agree. Stability is the controlling factor for safety in home investment. Stability, though, is impossible where people are living in trailers minus the wheels. Stability can be had only when one's roots are in the ground.

When it is possible over night to put all of one's possessions in a few trunks and move, stability is sadly lacking. When, however, one has other things, not so easily moved, in the grounds about the house, then one is stable—practically wedded to that spot.

Buy among such people. Buy where the grounds are part of the homes. Buy where your neighbors have taken root and buy in soil adapted to yours.

CHAPTER VII

THE PURCHASE CONTRACT—WHAT SHOULD IT INCLUDE?

DURING my life I have bought and sold a great deal of real estate. In my younger days, I often worked too fast for formal contracts; in fact, more often than not I never even conferred with an attorney. Consequently I got into some frightful messes. But now I do nothing without advice of counsel and I certainly would not sign a contract until he and I had been over it together very carefully.

You see, therefore, that I am a firm believer in legal advice when there are legal papers to be signed.

Up to the "great awakening" of 1929, the average citizen had three gods whose counsel he asked and whose advice he followed. They were his banker, his broker, and his lawyer.

For some of us, the depression shattered our faith in all three, but for others the lawyer still remains as the great adviser on babies' diets—and the value of the house or lot which they are to buy.

Now there are some lawyers with a keen business sense and there are lawyers with a nose for real estate, but most lawyers have little business sense and no nose

for real estate. Why should you expect it of them? That is not what they have been trained for.

The lawyer's function in any transaction is not to pass on the business side of the deal. His duty is merely to familiarize himself with the transaction as you wish to have it and then to put it through in proper legal form.

When a real estate operator asks his lawyer to prepare a contract, he takes with him all the information available—surveys, etc., and explains exactly what he wants accomplished.

He might, for instance, say: "Now, the view from this lot is important to me. I want you, therefore, to fix it so nobody can build within fifty feet of my line. If that can't be done, the deal is off."

The layman, however, too often leaves it all up to the lawyer excepting the price and the terms. Result: he gets his land all right, free and clear of encumbrances, but too often without the advantages he might have had, had he realized that it is the buyer's duty to stipulate what it is he is buying, and it is the lawyer's duty to buy just that, no more, no less.

Real estate, either lots or completed houses, is not bought the way you buy ice boxes or socks. You don't pay your money down and carry off the goods. Instead, when you and the seller have agreed on a price and terms, you both sign a contract to purchase.

The seller agrees on the one hand to deliver a deed to the property in question on a certain date. You agree on the other hand to pay the seller a certain sum of money

on that day if he delivers the said title, free and clear of all encumbrances.

If the seller is reliable, you, the buyer, usually make a payment of ten per cent of the purchase price on the signing of this contract.

A great many people sign this contract to purchase when it is given them by the real estate broker and then take it to an attorney. Of course this is too late, because then all the attorney can require of the seller is delivery of the deed as called for—good or bad. Instead of signing the contract, the buyer should take it to his attorney, explain exactly what he wants to buy, what he wants to use it for, etc.

The following is, for instance, a check list of questions which may or may not have to be included in the land purchase contract.

1. The price.
2. The terms of payment.
3. What are the bounds of the tract and what size was it represented to be?
4. If survey is not available, who is to pay for one?
5. What are the restrictions on the property—are they satisfactory?
6. Does purchaser demand that any restrictions be imposed on neighboring lots?
7. Is there anything in restrictions of record that prevents the buyer from using the land or house as he plans to?
8. Are there any encroachments, sewage, drains, etc.?
9. Will it be necessary for buyer to have rights over

neighboring property to maintain drains, to cut trees, etc.?

10. Are rights of way for roads, and public utilities necessary?

11. Is seller to extend or maintain roads, sewers, water lines, or electric light lines as a part of this contract?

12. Is purchase price to be a consideration for an option on adjoining land?

13. If the purchase is of a ready-built house and lot, are there any repairs, alterations, or additions to be made? If so, include specifications for this work.

14. Is the purchase price to include furniture, shades, ice box, stove, etc.?

15. Date of delivery.

As I have said, I never sign a contract now unless it has been approved by my attorney; likewise I always work through a real estate broker, though I would never think of signing a contract he might prepare or have prepared for me.

A broker naturally is anxious to make sales. Interested in putting through a deal, he must force the weaker of the two principals to yield to the other. Be forceful and he will work for you as even you yourself cannot work—but beyond a certain point, you must work alone because the whole thing simmers down to this: if you go out to buy a lot or a building, remember you are the buyer. You have a broker as a means of communication and a lawyer to guard the till, but it is up to you to call the plays.

CHAPTER VIII

PUBLIC UTILITIES AND THEIR EXTENSION

ENGINEERING and inventive geniuses have gone a long way towards making us self-sufficient in our modern homes no matter how far removed we may be from towns and neighbors. But despite their efforts, it is not yet advisable to go so far out as to eliminate the five little wires that connect us to the chatter system and the power plants of the world—and furthermore, wherever possible, it is advisable to maintain a connection to the town water supply. I can see no objection, however, to leaving sewers and gas behind.

If by chance you have the modern yen to pioneer beyond the reach of existing utilities, bear in mind that land without power or telephone, while cheap, is practically worthless and that land without city water, while not worthless, is certainly not so valuable as an equivalent plot on which a well and pump are unnecessary—the differential, in my opinion, amounts to one thousand to fifteen hundred dollars.

These figures at first may seem discouraging to pioneers. On the contrary, though, they open a definite chance of profit to the home owner who buys an unim-

proved plot and adds these improvements at the lowest possible cost—not difficult if one is patient and painstaking.

The service lines of a public utility either private or public are more numerous than the arms of an octopus. It is understandable, therefore, why they are not extended further without just cause and a guaranteed return.

Furthermore, to remain solvent, the utilities cannot invest money in poles, wire, and pipe unless the full and complete title to these lines rests in them.

They are on the other hand just as anxious as any other business to expand indefinitely wherever they see possibilities of increased sales and profits. If you wish them, then, to expand into new territory to include your home, it becomes your job to "sell them" on the idea just as you would "sell" any individual to interest him in your business.

The resistance to your sales talk will depend entirely on what your proposition is.

If the needed extension is along a public highway—the immediate prospect, one house—you will have no difficulty in obtaining a free extension of electric lines for six hundred feet or water mains one hundred to two hundred feet.

If the distance is greater, they will refuse unless you in turn agree to guarantee a certain annual consumption for a period of five or ten years. Energetic, you will go about and get others to join with you in this guarantee on a pro rata basis. Or, convinced of the future of the territory, you may decide to assume the respon-

sibility yourself. That is up to you. But in reaching your decision, do not forget to credit to the deal the increased value of the plot when the extension is realized.

If the proposed extension, on the other hand, is to be for one home on a private highway, you might as well spend your time trying to convert Jim Farley to Republicanism. It can't be done—or at least it can't be done unless you foot the bill: a mere matter of about twenty cents per foot of electric light line and ten dollars per foot of water main.

Of course, there can be many variations of these themes—many real ones and still more which you in your enthusiasm will concoct—remember, though, this is a matter of strict business for both you and the utility company. If the economics are correct, it can be a deal; if they are wrong, it can only be a headache to one or the other of you—maybe to both.

CHAPTER IX

THE WELL

STRANDED on a desert island—what would you do first?

That is a favorite question of my wife in gauging our children's development. Exceptional in no sense of the word, the children repeatedly reply they would look for sticks with which to kill a bird or build a house—wrong, of course, because long before they were hungry or needed shelter, they would be famished for a drink.

By the same token, if your lot lacks a city water supply, it behooves you to get busy—even before you plan your building—and provide yourself with an adequate and pure supply of plain aqua regia—water to you.

Opinion differs as to what constitutes an adequate supply. Some claim ten gallons a minute is none too much to supply two or three baths, while others argue that three gallons is plenty for any ordinary family. Unfortunately, though, it is not a case of rubbing an Aladdin lamp and making a wish. Wells cost money—and their cost increases shockingly with increased flowage. It would be nice to have more than enough water and yet it would not be so nice to spend so much on the well as to make it impossible to install some other important features in the house—perhaps the plumbing

itself which the well is designed to serve. So that being the case, I contend that a flow of three to five gallons is enough and more than enough for a family of five served by three baths and one lawn spray.

Sometimes, of course, luck is with us and we get more than we ask for at no extra expense. That, of course, is grand, too good to be true. Forced, however, to give an objective on which we can stand pat once it is accomplished, it is three to five gallons per minute, roughly, four to seven thousand gallons per twenty-four hours, seven to twelve times as much as statistics allow for five individuals in a city apartment.

Adequacy, however, implies not volume alone, but continuity as well. This country is full of fair weather friends and spring fevered wells or springs that wither and die completely during an August and September drought.

Personally, I have learned to look at the average existing surface well as a hoax. I fight shy of them as I would a pocketbook on the sidewalk on April first.

I don't know how many hundreds of times I have listened to clients rave about the rare qualities of the well on the particular property they intend to buy. "It has never been known to go dry, has been used continuously for two generations of Farmer Smiths, has watered sixty head of cattle, has bathed and washed unknown dozens of big and little Smiths."

These people forget, however, that sixty healthy cows drink less in a week than one silent toilet, in the hands of a city lad, consumes in a day. And they also forget that Farmer Smith and his wife would call it a flood if

asked to bathe in the water that a good Irish maid with her swing faucet uses to wash the tea things.

Of course, there are wells and wells—good and bad. For the moment, though, I am addressing myself more particularly to the surface hand-dug type and its brother, the surface spring,—in fact, to any of that breed associated in my mind with romantic memories of well sweeps, spring houses, and rippled reflections of two young faces peering down, head to head.

Generalities, of course, are dangerous, and though I condemn surface wells wholesale, I still realize that there are instances where surface wells and springs are continuous and have been known to weather the severest droughts with ample flow.

Wells, however, of this type are not surface wells in the strictest sense of the word. And the very fact that they persist in droughts is proof that their source of supply lies beneath the surface protected from the devastating effects of wind and sun.

They are actually the same as man-built driven wells except that their connection to the underground water supplies is by a natural pipe rather than one of fabricated steel.

Very few of us realize that ownership of a plot of land extends to the center of the earth and that it undoubtedly includes within its boundaries many subterranean everlasting brooks, springs, or lakes of crystal clear water.

Purchasers of land on Long Island, for instance, not only purchase a certain number of arable surface acres but in addition they automatically acquire an equal

right in a subterranean fresh water lake fed by underground streams from northern New England.

This lake, while not visible to the naked eye, is just as real, just as reliable, and just as accessible a water supply as the more obvious Lake Erie.

In Connecticut, New York, and New Jersey, the subterranean contours are apt to be more mountainous due to rock and hard pan. Large subterranean lakes are not so common; instead, there are myriads of little streams and brooks coursing between the various strata at different levels—all available to you for the tapping—not quite so simple as to say it but, after all, not so difficult as one might at first expect.

Whenever an area is underlain by a lake as large and definite as Long Island's, one is able to predict with accuracy at just what depth water will be encountered. On the other hand, it should be evident that fishing blindly for a chance stream one to two hundred feet below the surface in Connecticut is quite a different matter. There is no question but that streams do exist under your property and there is very little question but what there is at least one such stream for every square inch of it—but at what depth does the stream for any particular spot exist: that is the question,—not "Is there water?" but "At what depth will it be found?"

And this question is answerable only by actual experience, only when the well is a "fait accompli."

In Long Island and a few other restricted areas, drilling a well consists of driving a pipe through the soft sands until water is reached. In Connecticut, though, drilling a well is a slow laborious job—in addition to

being a gamble—because Connecticut is four parts rock to one part dirt.

A well on Long Island costs fifty dollars; a well in Connecticut can cost anything, though $500 is a safe outside figure in most instances. To make matters worse, well diggers on Long Island give flat contract prices, whereas in Connecticut and New York they work only on a footage basis—with you and the Lord taking the risk.

This condition, while regrettable, is unavoidable. It does, however, serve to accent further the idea that the well should come before the house, because until its cost is fixed, the background of the whole financial set-up is a very large and threatening *"IF"!*

But more important than the cost or adequacy of your water supply is its quality or "potability" as the chemists call it.

On that question—highly technical and uninteresting —I can only warn you to avoid so far as possible any surface supplies. If you have a deep driven well, see that the joint between the casing and the rock is watertight —and no matter what the supply, have it tested periodically, remembering there is no such thing as an absolutely safe water supply any more than there is an absolutely safe method of riding a railroad train. Knowing this, sanitary engineers, despite their guarded city reservoirs and watersheds, make hourly tests in an attempt to "smell the smoke before it bursts into flame."

CHAPTER X

PUMPS

Most of us before we were three days old were experienced hands in the practical application of the basic principle underlying the design of suction pumps known to the trade as shallow well pumps.

And before we were ten years old we instinctively evolved in addition the more involved deep well head.

And yet most laymen profess complete ignorance on the subject.

In this book, there is no need to go into a detailed discussion of pumps and pump design. Since, however, there is a cost difference of at least two hundred and fifty dollars between deep and shallow well pumps, you should know at least when you will and when you will not have to use one or the other.

A suction pump, of course, is nothing but a robot of a child sucking through a straw.

A piston is used to duplicate the sucking effect of its cheeks, and a rubber valve, plus a reverse stroke of the piston, mimic your throat muscles as they catch the liquid and drive it to the storage tank, your stomach.

This system works very well provided the water to be

sucked is within twenty feet of the surface. After that, "lady atmosphere" refuses to assist.

What more natural then than to follow the example of the youngster at the brook when the surface is below the ground level? What does the child do? Leans over, of course, and stretches giraffe-like until the water is within reach of his lips.

And that, simply put, describes the so-called deep well pump. It is nothing but a suction pump on a neck-like rod lowered to the level of the underground supply. If the mountain won't come to Mohammed, why then Mohammed must go to the mountain.

It should be quite evident that a simple suction pump is going to be cheaper than a suction pump plus a mechanism long enough to reach sources more than twenty feet below the surface. Add to this the fact that deep well pumps must be located over the well and thus require a separate frost proof pump pit, whereas shallow well pumps usually can be located in the cellar, and you can see easily enough why the difference in cost can be as much as two hundred and fifty dollars—a saving worth making if possible.

When your well is dug, you will have to make the choice on the strength of the well digger's test, which should tell you not only the total flow of the well when drained dry, but also the flow at the suction pump limit of twenty feet.

His report, for instance, might state that the total flow of the well is fifteen gallons per minute and that the flow at twenty feet below the surface of the ground is seven gallons.

If you for some reason feel that an available supply of fifteen gallons per minute is essential to your comfort, you must install a deep well pump to achieve it. If, on the other hand, seven gallons per minute is ample, you can, with perfect safety, install a suction pump.

The well digger's report, however, might show a seven-gallon flow at the bottom with one gallon or less at twenty feet.

In that case, of course, you have no alternative but to install a deep well pump—whether you like it or not.

While suction pumps are limited in their ability to raise water by suction, they are not limited in their ability to drive it.

Like the teacher and the scamp, she may be slow at catching him, but once she gets her hands on him, there's action.

A piston, when sucking, is limited in its power by the atmosphere. A piston, though, in driving, is limited by nothing except the motor driving it.

Water can't be raised more than twenty feet by suction no matter how much horse power you put behind the pump—but water could be driven to the moon given the pipe and the wattage.

If your water supply, for instance, is a shallow well, a brook, or a lake in a valley two hundred feet below your house, you don't need—in fact couldn't use—a deep well pump.

To be sure, you won't get water if you locate the pump in your cellar, but why not locate it down at the brook and drive it up to your house?

And having settled on the type of pump necessary,

you have next to select the motive power and the tank.

Personally, I find it difficult to imagine life without electricity, and yet the better part of my own youth was spent at a country place dependent upon a gasoline engine for water.

Fortunately, however, there was a lake in which we could bathe on the off-days when both hired man and the engine refused to function.

The architect of today, though, given a similar problem, would insist upon a home generating plant plus an automatic electric pump.

The old gravity tank on the hill would be exchanged for a much smaller air-bound pressure tank in the cellar and the whole, fully automatic, would be forgotten.

Fortunate enough to have electric service on your lot, you have no use, of course, for the electric generating system, have only to buy an electric pump, deep or shallow, and a pressure tank.

The pumps can be had in various capacities and sizes for varying conditions. In selecting one, you should be guided by your dealer's recommendations, remembering, though, that there is no sense in having one with a pumping capacity greater than the normal flow of the well—or your personal requirements.

And in the matter of tank sizes, balk at paying for a tank having a total capacity of more than one-half the pump's hourly capacity. By doing this, you not only will save money, but will in addition assure yourself of a supply of clear, cool, fresh water as against flat, dull water stored in a larger, more expensive tank.

And with an automatic system installed, consider

yourself lucky, because, although the initial cost may have hurt, you are blessed with a cheap and plentiful supply of water. Lawn sprinklers and swimming pools, luxuries in towns and cities, are possible to any one having his own adequate water supply equipped with an electric pump.

CHAPTER XI

THE SEPTIC TANK—WHAT MAKES THE WHEELS GO ROUND?

One of the old troubles of the isolated small house was the cesspool—first cousin to the Chic Sale outhouse.

A cesspool like its relative was nothing but a hole in the ground in which solid sewage was collected. Once a year its top was removed and the solids baled out and buried. Then about every three years a new and sometimes larger hole had to be dug to replace the old one when the soil about it became so fouled with scum that it would no longer permit the liquids to run off.

I think the greatest single improvement in small house construction has been the development of the septic tank, a bona fide system of sewage disposal.

A septic system is no collector but actually a disposer of the sewage. It disposes of it completely, except for one small fraction, the grease and some remaining residue.

The average person uses from fifty to a hundred gallons of water a day. Therefore, our problem is to dispose of an equal amount of sewage—for a family of five, five hundred gallons per day, 182,500 gallons per year—and this sometimes on a lot 70′x100′.

That we have been successful is shown by the fact that many small cities have abandoned plans for municipal disposal plants and instead depend upon individual septic systems. This has been done with entirely satisfactory results—results which are far more satisfactory than those which accompany the usual American system of converting otherwise beautiful rivers into open sewers.

The cost of a septic system, assuming its life to be only ten years, is 1/1000th of a cent per gallon of sewage treated and the cost of maintenance is 1/10,000th of a cent per gallon.

These figures must sound to you strangely like the soap magnate's statistics "...if placed end to end..." No, I am not qualifying for a Rotary Club but merely trying to show that the sewage disposal problem for the small house is pretty well solved.

I am going to pass right by the cesspool. Even today they are being installed and in sandy soil they apparently are giving satisfactory service.

As a matter of fact, sandy soil is the one place where they present a real menace—not to you, necessarily, but to your neighbors.

Cesspools work in sandy soil because the sewage seeps through the bottoms and sides as quickly as it is fed to them—seeps through and comes out as untreated sewage in streams or springs. This is a menace which is not tolerated in towns where sewage systems are inspected —a menace in which self-respecting citizens do not wish to be involved.

Eliminating the cesspool and, of course, assuming a city sewer is not available, we have left two good methods of treating the sewage from your house: first, the septic tank; and second, by subdrainage filtration.

The latter, sub-drainage filtration, is a very costly system used only in handling groups of over twenty-five houses or in cases where the septic tank actually would be submerged.

Such a plant is an engineering job and not to be considered for the average small house. I shall leave its explanation to the expert you must consult if your lot is a swamp and cannot be drained or if you plan to treat a very great quantity of sewage.

Ninety per cent of our suburban homes today have septic sewage disposal plants concealed under their front lawns. The cost is reasonable, the plant simple to install, and its operation automatic.

It consists of two main elements: first, a tank, and, second, a tile field.

The function of the tank is, first, to separate and collect any solids and grease the sewage may contain, and, second, to convert all other organic solids into liquid.

The function of the tile field is to distribute the liquid discharged from the septic tank over a large enough area so that it apparently does not wet the soil but, nevertheless, does come to the surface and is evaporated or disposed of as vapor.

A septic system depends for its operation on the happy coincidence that when domestic sewage is confined in a space without light or air, it automatically

generates a bacteria which feeds on the solids and excretes nothing but liquid. (This bacteria is known as the Septic Bacteria.)

Queer that an animal with such an odd taste should have preferences but, nevertheless, it is a fact—he absolutely refuses grease.

The length of time necessary for this fellow to do his work varies: cloth and heavy paper may keep him busy for several days, but ordinary legitimate solids are almost completely consumed in twenty-four hours. Therefore, in figuring the size of the septic tank needed, we allow a volume equal to one day's average consumption of water which is from two hundred and fifty to five hundred gallons for five people.

The location of the septic tank is somewhat of a moot question. F.H.A. officials insist that it must be located seventy-five feet away from any well, and health authorities, more exact, fix the location with regard to the subterranean rock formation. I believe, when the size of the plot permits, the septic tank should be located seventy-five feet from the well and with due regard to the rock formation. On the other hand, I do not approve of crowding it into one corner of the plot just to keep it away from the well, knowing only too well that by so doing I may be creating another nuisance equally dangerous.

If you have no well, there is, of course, no dispute. The tank should be located as near the house as possible and on the highest possible point, leaving plenty of elbow room for the installation of the tile field and its future enlargement if that becomes necessary.

If, however, you are dependent upon a well for water supply and upon the F.H.A. for a mortgage, I should suggest that you consult the F.H.A. inspector and obtain his approval before actual work on a system is begun, and if there is any reason to dispute his recommendation, call in the local health officer as arbiter.

The tile field is connected directly to the septic tank and consists of four-inch porous drainage tile laid out in various patterns, depending upon the local terrain.

The tile and septic tank are laid as close to the surface as possible, usually about twelve inches below grade.

The trenches in which the tile is laid should be about twelve inches wide and deep enough to permit of at least six inches of coarse gravel or cinders beneath the tile. The tile is laid on this cinder fill and then surrounded and covered with more cinders to a depth of six more inches (total depth sixteen inches). Over the whole, lay a band of medium weight roofing paper, replace the top soil, and seed.

The amount of drainage tile required depends upon the porosity of the soil. Liquid will seep through and evaporate more readily from a light sandy soil than from a heavy clay. Therefore, in gravel, twenty-five to fifty feet of tile per person is sufficient; whereas in clay or hardpan, one hundred feet per person is none too much. The pattern in which the title is laid, as I have said before, depends pretty much on the terrain.

The idea is to obtain an even distribution of liquid (sewage experts call it effluent) over the entire field. On flat lots the tile is laid almost dead level; the danger on sloping land is always that the liquid will catapult

to one arm which becomes overloaded and makes a messy wet spot on the lawn.

So long as clear or almost clear liquid is discharged from the septic tank, a proper tile field will function for many years without becoming clogged. But, if the septic tank is below capacity and the sewage undertreated, or if sewage containing a large amount of solid matter overflows the tank and is fed to the field, it will clog up very quickly.

In other words, you may think my figure of a two hundred and fifty to five hundred gallon tank for a family of five too large and try to prove that I am wrong by putting in a smaller tank and having it operate perfectly. But wait, the proof will come a year later when wet smelly spots show up all over your lawn. The tank was too small—the tile field has become clogged with solids—it cannot distribute the liquid; so it comes to the surface. Grease will do the job even more quickly if it gets to the tile field. Every proper septic tank, therefore, is designed to trap and collect the grease in the tank itself. This grease must be removed every year or two.

Septic tanks contain two or more compartments. The greater part of the grease collects in the first compartment. Being lighter than water, it floats. If not removed soon enough, it keeps building up until it finally clogs the inlet in the tank and you realize it by the fact that toilets overflow and the kitchen sink and laundry tubs back-fire.

To avoid this trouble some architects require a grease trap to be installed ahead of the septic tank.

This grease trap improves the operation of the septic tank somewhat but costs about forty-five dollars and is no cheaper to clean than the tank itself. So, for my part, I think that it is superfluous and instead warn my clients they must have their tanks cleaned every two years and annually if possible.

There are several different types of tanks on the market. The most used is the cheapest—the metal tank. Next most frequent is the vitreous tile tank; and, finally, the aristocrat of them all is the pre-cast concrete tank.

The metal tank I condemn without question. I have known them to last a good long while but I also have known them to rust out in one or two years.

The vitreous tile tank I find unsatisfactory because it is lacking in capacity. Apparently cheap, it actually is quite expensive gallon for gallon.

So that leaves us nothing but the pre-cast concrete tank.

Of these there are many makes and designs—all, no doubt, good and efficient tanks.

Provided they are designed definitely to prevent the passage of grease to the tile field, provided they have sufficient strength to withstand the load of the dirt covering them, and provided they have sufficient capacity to retain the sewage discharged from your house for an average period of twenty-four hours, there is little choice.

The proper installation and coördination of the various parts, though, is what makes a system. I have pointed out the theory of the installation and possibly

given you enough information so that you could build and install your own plant if you became stranded on that mythical South Sea Island. But, so long as you are within reach of a telephone, depend on the local expert to lay out and install the complete system for you.

The cost, of course, will vary. Cheap speculative builders will tell you that a system can be had for fifty dollars but I firmly believe that one hundred dollars is the very least for which a working plant can be built, that is, to be anything more than a bluff. From this base, the price goes up in accordance with increased capacity necessary and, strangely enough, the capacity also must be increased as the cost of the house increases even though there may be no more occupants concerned. This, of course, sounds like a hoax to rob the rich but somehow as we become more aristocratic in our houses, we have bigger sewage problems. One and one-half per cent to two per cent of the total cost of the house seems to be about right. Spend $50,000 for your house and you must spend $750 to $1000 for your sewage plant—and even if your house costs less than $5000, you still must spend $100 on it.

The cost of operation consists merely in the annual cleaning charge, usually about fifteen dollars. Done by special crews trained by the manufacturer, this cleaning causes no more mess than cleaning a carpet. They are in and off your premises in a few hours.

I believe that this discussion pretty well answers any questions my clients have asked me from time to time. The fact that we generally depend upon surface evaporation for the ultimate disposal of liquids is the reason

why the system is installed just beneath the surface of the ground and also is the reason why laundry tubs cannot be installed in the cellar when a septic tank is used.

The fact that we depend upon surface disposal, furthermore, is the principal "factor of safety" and removes, to a large extent, the danger of pollution of wells and brooks.

The system is not one hundred per cent perfect. Sewage experts dream of the perfect system. That has not yet been reached, but the septic system is as near perfection as any other system and far superior to any other method of disposal available at this time for the small house.

CHAPTER XII

PLANS—HOW SHALL I GET AND USE THEM?

UNDERSTAND that I make my bread and a little butter from plans; perhaps I am not unbiased.

I shall never forget the first plan I ever drew—I was a farmer at the time, fresh from New York, prepared to show the farmers in the world "how it should be done."

I had learned quite a little about building—had in fact just completed a chicken house. When it came to the roof, I had started shingling in what I thought was the usual and accepted manner. Suddenly I realized that I was under observation. The rural mail carrier had become fascinated by what I was doing, stood on the ground watching me—awed.

"Well, what the hell are you doing?" he finally asked.

"Shingling this roof, Charlie," I said, offended that he was not more appreciative.

"Well, I'll be damned," he said, "that's the first time I ever see'd any one shingling a roof, startin' at the ridge an' workin' down—well, can't be wastin' time with you, got to get this mail to town."

You see, therefore, what my qualifications were when I planned my first house.

First I did my floor plans—for a side hill lot with a beautiful view out over the valley.

I seemed to be concerned with nothing but that view. Somehow I had to make the most of it so I made the front of the house two storied: dining-room and kitchen on the lower level and living room above it for the whole width of the house.

That finished, the other things followed in logical sequence—the chimney and fireplaces, two bedrooms, and a bath. But I had no elevations. I was stumped.

Going into town on the train one day, I sat beside quite a famous architect. I decided to get a little free advice. I sketched my floor plan and asked for suggestions as to profile.

He demurred—said he would have to have a drawing board, two scales, and six triangles before he could draw anything.

Finally in irritation he asked me to sketch what I thought the profile should look like. A little mad by then I boldly took a pencil and drew the profile of a salt box house.

"What pitch," asked the architect, "is that roof?"

"I don't know. What difference does that make?"

"Well," he replied, "how do you know how it is going to look if you don't know the pitch?"

"Why, *that's* how it is going to look," said I astonished, "can't you see?"

"It has to have the proper pitch," he said smugly, "to be right. It doesn't make any difference what *you* think

it looks like. It won't be right if it doesn't have a ten-twelve pitch."

"Thanks," I said and stuck my little drawing in my pocket for future reference.

That night I completed my plans on drugstore paper. I finally completed the house and, as far as I am concerned, proved that architect and his whole school of orthodox designers to be cockeyed. It was a darned good looking house.

Perhaps this story is a little out of place but I tell it because, although I am now a fully registered architect, I think I have a little better understanding than more formally trained architects have of those people who build without benefit of architect either because they cannot afford one or because they don't want to be submerged completely in another's ideas.

How shall they go about it? Well, let us see first what the pitfalls are.

Suppose you can draw and you draw up a fine set of plans and specifications. What then?

They probably would be rejected by the F.H.A. and the building inspector because they were not signed by a registered *local* architect.

Absurd, of course, when you think that a similar regulation got the late Raymond Hood into "hot water" in a mid-Western city and he—the greatest living architect and designer at the time.

Suppose you didn't draw your own plans; suppose instead you had read my book, *Houses of Stone,* liked plan No. 54 and purchased a set of blueprints from me.

What then?

Well, when you got the plans and tried to put the house on your lot, you probably would find the dining room was on the wrong side. You might decide you didn't want a studio-living room, and so on. In other words, it would be a grand plan, BUT—

Even if the plans could be used "as is," you might have difficulty with the building inspector because I am not registered as an architect in your state.

If the changes to my plans were limited to the interior arrangement and were not radical, you probably could get the approval of the F.H.A. but if they were so extensive as to involve new drawings by yourself or a builder, you would again be held up for an architect's certification.

So there you are—and you say lobbying doesn't pay dividends.

I put the question to my wife, asked her what she would do, and here is her answer:

"I should take my plans to a really reliable builder; I should get him to have them drawn up for me, and get him to attend to having them certified to by an architect."

Of course, in doing this, she would be obligating herself to one builder. Crooked, he could take her hide; and what she would be saving in architect's fees, she might be paying out in extra profit to the builder. Nevertheless, it is sound advice. Most people are honest, you know—at least if you trust them—and builders are no exception.

CHAPTER XIII

CONTRACTORS—ONE OR MANY?

Some day I hope to make a psychological study of the effects of craft upon temperament and habits.

It should be interesting and valuable to uninitiated architects and builders—for instance, why do painters talk so much and cry so hard, what is the fine social distinction that makes masons and carpenters eat apart by mutual agreement, why do plasterers enjoy splashing plaster everywhere at great effort, and why do carpenters insist on writing on every board that is to be left unpainted?

All these questions and hundreds more will be your personal problems if you try to save money by avoiding both architect and general contractor.

In addition to these perplexing social problems there will be problems of mutual responsibility. Because you are green at this business, the painter probably will say it is not his job to wash the window glass and the electrician probably will refuse to hang the fixtures without an extra charge—all of them will leave their débris for you to wallow in for months afterwards.

And then, as if that were not enough, you will find yourself surrounded by as many stool pigeons as there

are contractors, each advising you to watch the other, while he himself may be putting something over.

Building is fascinating. I love it—because I enjoy this game of enforced coöperation. It is the nearest thing to leading a ballet that I know of. But I don't recommend it to any one for profit or pleasure unless he intends to devote his lifetime to it.

When you cross the continent by rail, you may elect to buy a through ticket from one of the main trunk lines, board a crack train in New York and step out of it in California, or you might go to a travel bureau and engage its services to develop a schedule and purchase tickets for you on the various railroads that have to be traversed, or you might go ahead willy-nilly, with no plan and no fixed schedule, buying tickets from each railroad for its portion of the trip.

In planning to build, prospective home owners have much the same choice.

They may elect to turn the whole problem over to a general contractor, getting from him a through ticket, making him financially responsible to see that they and their baggage come through safely and making him shoulder the burden and bother of synchronizing the efforts of the ten or fifteen separate sub-contractors necessary to complete the job.

Or, realizing that these services must be paid for, you may decide to eliminate the general contractor and substitute for him the architect.

In that case you have in effect substituted the travel bureau for the trunk line railroad.

Without doubt the travel bureau will get you to the

other side of the country safely. If there should be a wreck, though, or if your baggage should be lost en route, to whom would you look for settlement? Not the travel bureau, in railroading, and not the architect, in building. Both function as advisers, neither taking any financial responsibility.

It is important that you understand this difference, because laymen very often elect to work with an architect but without a general contractor, unaware that by so doing they in effect have been put into the general contracting business with an architect as manager.

I approve of this system but believe that the owner should realize that when operating in this fashion, he, the owner, is assuming the financial responsibility for his architect's mistakes. I state it, therefore, in terms which cannot be misunderstood.

For the purposes of this book, though, the adviser or travel bureau is eliminated. The question is merely whether you should buy a through ticket or whether, bag in hand, you should deal with the ten or twelve sub-contractors independently, one by one, as they come along.

If you are building from scratch, i.e., a new house, I certainly do not recommend separate negotiations. An architect, experienced, can do this and do it profitably. His contracts will be carefully prepared and will be interlocked so that every item is covered.

You, inexperienced, no doubt will forget many. For instance, you may forget to specify whether the carpenter is to "cut" for the plumber or whether the plumber is to "cut" for himself. Everything will go

along nicely until the "cutting" point is reached. Then either or both will demand an extra; and they will be entitled to it.

If you have a general contractor, the same argument might arise. If it did, it would be up to the general contractor, not you, to settle it, because your contract with him would be for a completed building.

And in addition to the increased financial risk in working without either architect or general contractor, there is also the element of time and bother.

A job has a definite rhythm. For speed and efficiency this rhythm must be maintained.

An experienced builder knows this rhythm and the sequence of events. He will know, for instance, several days in advance when to notify the painter to get set in the wings for his act. He neither rushes the job nor lets it drag. At least, if he is any good he doesn't.

Neophyte owners, though, acting as their own contractors, fret and fume over normal delays, cause greater ones by ignorance and create an atmosphere of uncertainty about the job which inevitably is reflected in the work (and in the owner's crop of hair).

The ideal, of course, is to build with both architect and general contractor. Unable to afford both, you must decide which should be eliminated.

I think, however, that it is the height of folly to attempt to build without either.

And yet even that statement must be qualified.

A general contractor necessarily has a large organization. Its rhythm is fast and furious. Remodeling jobs, though, very often are not amenable with economy to

this pace. Many of them have to be handled like a ball of yarn that has become tangled.

Put a general contractor on such a job and his costs will be excessive because patient slow unraveling is necessary before the wool is finally ready for weaving.

In such cases I advise employing a plodding craftsman type of carpenter and mason to straighten things out. The process will be slower and the cost uncertain. That, however, is quite normal in remodeling. The cost in any event probably will be less than the general contractor's figures, providing, of course, that your craftsman's craftiness is limited to carpentry and masonry.

The importance of this matter cannot be exaggerated.

Owners, building on borrowed money, are in effect under contract with the bank or loan company to build and complete the building in question in accordance with the plans and specifications.

It is the owner's responsibility to complete this contract come what may and no matter what his architect or contractors may do to him. He can underwrite the responsibility by letting the whole job to a responsible general contractor. He can minimize the risk by engaging an architect as adviser or he can try to save money by assuming the whole load unassisted.

In any case, however, it is the owner's responsibility and he is the only one qualified to weigh his resources against the risks and plot the course.

CHAPTER XIV

THE BUILDING CONTRACT—ITS FORM AND WHAT IT SHOULD INCLUDE

I AM very sure my attorney would find an error in any document put before him whether it were the Lord's Prayer or Burke's Speech on Reconciliation. Lawyers apparently are iconoclastic by nature.

Now no matter how your lawyer objects when it comes to the building contracts, if there are to be any, insist that he follow word for word the form developed by the A.I.A. and on sale at any architectural book or supply store.

This form of contract has been tested in court time and time again. No doubt it can be improved upon but not by any attorney you or I probably could afford.

A great many people feel that contracts are necessary only when they are dealing with shady characters. I believe, though, that the reverse is true—contracts are guides to honest people, and no contract can be drawn that will protect you from dishonesty.

A building is composed of several thousand parts. Contracts for their construction, therefore, can be divided among the several contractors and the owner in as many different combinations. If you, yourself, sublet

the job to a number of different contractors, the tinning or flashing in one case might be a part of the roofing contract and in another it might be allotted to the plumber. Likewise, if you let the whole job to a general contractor, he might or might not be expected to furnish electric light fixtures or to hang the towel bars, soap dishes, etc., in the baths. A clear, concise contract, therefore, is necessary not to protect you alone but the contractors as well so that there can be no misunderstanding.

The contract form I mention is, of course, a general form covering the matter of payments, liens, etc. In order to be applicable to your job, a copy of your plans and specifications must be attached to it.

I assume that you will purchase a set of plans and specifications from a building magazine or that your builder will supply them. No matter how you come by them, you must go over them carefully and understand exactly what they call for. Go to the plumbing supply house, for instance, show the specification to the salesman, and ask to see the exact fixtures specified. Go to the lumber dealer; ask to see the type of doors, windows, etc., that are specified. If there are any items to be furnished by you, determine their cost so there will be no surprises. Be exact in your preparation and you will finish with precision.

And finally, verify the method of payment—if you are dependent upon mortgage payments for cash, be sure that the time-table of payments by you to the contractor synchronizes with the payments from the mortgage company to you. Remember you are agreeing to

make certain payments when the contractor has completed his work. If you believe "example" is the best teacher, be prepared to live up to your part one hundred per cent and you can honestly demand the same of your contractor.

A great deal is said about the failure of contractors to live up to their contracts. Frankly, though, I have met only four people in my life who honestly met their contracts with the contractors—most people fail on this matter of meeting payments. Be the exception and I am sure you will get an exceptionally good job—unless, of course, your contractor dies of shock.

CHAPTER XV

CONTRACT—PAYMENTS

You can't run a car without gas—on the other hand, too rich a mixture is wasteful and may stall the works.

In the same way money fed the contractor too sparingly is poor economy and money paid in advance may mean a deficiency on his part at the end that will cost you money.

There are several systems of payment. In one the contractor is paid monthly eighty-five per cent of the cost of the labor and material incorporated in the job. In another he is paid certain fixed sums as certain phases of the job are completed—when the side walls and roof are completed, etc. All payments, however, are based on the principle that the unpaid moneys always must be sufficient to complete the job if the contractor falls down.

Architects prefer the eighty-five per cent basis, but to laymen, particularly if they are being financed by a mortgage, I commend the step basis and I recommend that they follow the same schedule laid down by most mortgage companies in making their payments to the owner as follows:

7% on completion of cellar,
23% when the building is wind and water tight,
30% when plumbing, heating, and electrical roughing are completed and the building is plastered,
25% when the building is substantially completed,
15% when the building is finally completed.

This schedule of course is based on the assumption that there is a general contract—if there is to be no general contractor, a similar schedule will have to be worked out for each sub-contractor. To make their payments dovetail properly is not so simple—just another disadvantage in being your own general contractor.

CHAPTER XVI

LIENS: WHAT MANNER OF FISH AND HOW CAN THEY BE AVOIDED?

If you were building with an architect, I should tell you to forget about liens—but since you are not to have an architect, you should familiarize yourself with the lien problem which is peculiar to the building world.

Lien laws vary throughout the Union: New Jersey has one code; California, another; and Connecticut, still another. I therefore must refer you to your local attorney for exact information applicable to your specific problem. I can only discuss the matter in general terms.

To my mind, the lien laws are distinctly unfair to the owner and do more to harm than to help the building business.

How many radios do you think would be sold if it were necessary for you to require the shop in which you bought one to prove that the manufacturer had been paid in full?

How many automobiles would be sold if it were possible for the manufacturer of the spark plugs to demand payment for them from you if the dealer or maker of the car went broke?

When you build there is always that question. Is the contractor using your money to fly around town at night or is he paying his bills with it? If he does not pay them in full, you may find that you will have to pay them for him in addition to what you may have paid him previously.

Many people assume a contractor's credit is proven by the willingness of material houses to furnish material to his jobs. As a matter of fact, protected by the lien laws, the material men may be delivering on the owner's credit without the owner's being conscious of this fact.

In general the lien laws provide that the owner of a property in which building material has been incorporated must pay for the material if the contractor does not. To enforce payment, they may file a lien against the property. This lien is actually an involuntary mortgage and has priority over any other liens or mortgages not of record when the material was delivered.

In some states, this "right" expires sixty days after the material is delivered and in others the time limit is ninety days. In some, it is necessary to file "an intent to lien" when the material is delivered and in others the "intent" need not be served until the last day of the lien period. But every state has a lien law which protects the dealer and leaves the owner open to lots of grief.

There is only one sure method of preventing trouble on this score. Never make payment to any contractor without proof that his bills are paid. Demand receipts

and in addition demand an affidavit that those receipts include all material used on the job to that date.

If your house is financed by a mortgage, you will be required to have a waiver of lien signed by the contractor and his material men. You may think this waiver is a protection to you. Read it carefully, though, and you will see that it merely covers the mortgage—that is, the signers are not waiving their right to lien, they are merely agreeing that their rights are to be subordinated to those of the mortgagee.

When the building is completed, owners sometimes require a blanket waiver of lien from the contractor. I don't advise waiting that long. If there is going to be trouble, you probably will find it dates back quite a way and should have been corrected in the beginning.

That, then, leaves just one absolutely sure method of protection: never pay any sub-contractor without proper proof that he in turn has paid his men and dealers. The workmen, of course, will make it known to you if they are not paid but material men may be silent to the last day. To protect yourself against these sleeping wolves, demand, in addition to the receipts, an affidavit from the contractor that his men and bills are all paid.

CHAPTER XVII

THE BUILDING INSPECTOR AS A HELPMATE

The F.H.A., the building inspector, and the inspector for the mortgagee can be a great help in building if the owner only will avail himself of their services and advice.

Naturally, they are bound and fettered by a few antiquated and old-fashioned regulations. On the whole, though, they are interested in but one thing, honest and safe construction.

Because city or town ordinances have had to be written so as not to work an unnecessary hardship on the poorest person who might want to build, your building should be acceptable to them without question if it is built in accordance with the practice which I have set forth.

As a rule, the F.H.A. inspector visits the job three times during construction: first, when the footings are dug but not poured; second, when the framing is complete, the partitions set, and the wiring and plumbing roughing complete—*but before the lath is in place;* third, when the building is finally completed.

The bank probably will make independent inspec-

tions: first, when the roof is on; second, when plaster is complete; third, when the building is completed.

The building inspector will visit the job many times unofficially but it is usually mandatory that he inspect first when the foundation is being poured, second when plumbing and wiring roughing are complete, third when the building is ready for occupancy.

This means, then, that three experts will make nine independent inspections of your building at no extra charge to you.

Certainly you should be able to get some good advice and free supervision by conferring with them—especially from the building inspector.

GRADING AND PLANTING—HOW MUCH IS NECESSARY?

Too many houses are built on the basis "and now my story is done."

In order to obtain a final payment on a mortgage, it of course is necessary for you to do a certain amount of grading and planting.

Bothered with an F.H.A. inspector who is accustomed to small town stuff, you may even be compelled to insert at least one silver pine and two bayberry bushes in the planting. After that, though, fight back, put what money you have into the house and a thorough clean-up of the grounds. Let the rest of the work in the grounds wait to be performed, as it should be, through the next fifty years.

Above all things, avoid "base" planting that resembles nothing more than a Victorian photograph of a family group. Houses do not need to have their ankles protected—in fact their appearance is improved by a frank display of strong underpinning.

If you, for your part, have money to burn, spend it on the soil. Instead of spreading the usual two or three

inches of top soil, lay it on thick and heavy. The money spent for this will be repaid in grass and blooms.

And while we are on the matter of grass, let me beg of you to make provision for a compost pile. In the absence of anything more formal, buy a ten-foot length of one-quarter inch mesh chicken wire four feet wide. Fasten the two ends together to form a cylinder, upend it in a convenient spot and use it to hold any and all organic matter you can find, even to including your neighbors' leaves.

Two or three yards of this compost mixed into your soil yearly is equivalent in its effect to the best efforts of any ordinary horse or cow. Add a little lime and the problem of securing a hardy, drought-resistant lawn will be partially solved.

If you buy an acre or two of land and not just a city plot, don't mind leaving a bit of it in its natural state—this not only will mean less lawn mower exercise on Sundays but also will add to one's privacy—psychologically—by forming a barrier between oneself and others.

And finally, in all planting arrangements, do not forget that beauty is not limited to colorful blooms. They, in fact, are nothing but parasites, enjoyable to look at and smell. For balance you need something practical and orderly; so I heartily recommend a well planned, orderly, and weedless vegetable garden. It not only will be pleasant to look at; it will give meaning to the whole plan.

CELLAR—HOW MUCH?

You know the story of the incoming Chinaman met by an American friend at the steamer in San Francisco. He was dragged bodily at breakneck speed into buses, trolleys, and taxis until they finally boarded the ferry just as the gang-planks were being raised.

"Thank God!" exclaimed the American. "We saved three minutes."

"Yes," quietly answered the Chinaman, "now how shall we spend them?"

Well, it's a long way from the deepest cellar to Chinamen, but to those advocating large cellars—who will gladly spend hundreds of dollars in their achievement and risk untold trouble from water—I ask, "Well, now that you have it, what will you do with it?"

It is no good to store vegetables in, because it holds the furnace. It keeps the first floor warm only if you go to the expense of heating it; and the claim that it keeps a house dry is as illogical as it would be for you to dig holes for your footsteps when crossing a wet spot.

Twenty years ago all our heating systems worked by gravity. Today steam plants are the only ones that still have faith enough to depend on nature for circulation.

Hot water and warm air systems have resorted to forced artificial circulation. Consequently, a small cellar is necessary if you heat by steam, but if you use the preferred hot water system, your furnace can be anywhere, including the attic, and give as good—perhaps better—results.

With the furnace moved above ground, the question becomes one of heating the air under the first floor. In cellared houses of the past, this has been cared for by heat automatically radiated from the furnace—radiated accidentally but nevertheless costing just as much as though it came more formally from a radiator. In the cellarless house, heating must be accomplished by running pipes under the floors in an open air chamber—an air chamber as small as possible so it may become really warm without excessive heat losses.

This is accomplished most easily by laying a concrete slab under the entire house and running the uncovered heating pipes through pipe trenches in this slab. The slab serves several functions: first, it lifts one out of the wetness; second, it prevents the entrance of termites or rodents; and, third, it efficiently restricts the space under the floor which has to be heated.

This, of course, is expensive construction—as expensive or almost so, as a cellar. A cheaper variation is a small cellar for the heating plant and an open air space, under conventional floor joists, heated indirectly by the furnace. I prefer the concrete slab, but either is preferable to a large, awkward, troublesome hole in the ground—first cousin to a well and yet expected to have none of its relative's characteristics so far as water is concerned.

CHAPTER XX

CELLAR—OF WHAT SHOULD IT BE BUILT?

Speculative builders are well aware of the fact that they are paid only for what is above ground, so naturally are loath to put too much below.

The buyer, though, despite the fact that his willingness to buy is actuated by what his neighbors can see, must nevertheless concern himself seriously with a building's legs—particularly that part of its hindquarters that form the cellar walls.

Of course one must be reasonable. One cannot expect a five hundred dollar cellar in a three thousand dollar house—that is, if he expects the house above to have any semblance of good construction. On the other hand, one should not buy a ten thousand dollar house in two hundred dollar shoes.

Today we are over-run with false economies. Materials with otherwise good reputations are being used to perform jobs to which they are not suited merely because they are cheaper.

Now cellar walls not only have to carry the building above but also have to hold back the dirt around them.

They then must be strong not alone in compression but in *thrust* as well.

Remember back to those works of art we used to build of blocks when we were kids. So long as the blocks weighed down on each other, our structure was safe but, given the slightest kick from the side, down it tumbled.

With that in mind, inspect any really old house with cellar walls of stone—have they bulged and given under the side pressure? Probably.

Today we don't have many cellars of stone but we do find too many of concrete blocks—avoid them. Insist on walls of solid, poured concrete. Maybe they will add fifty or sixty dollars to the total cost. Maybe they will not affect your neighbors' appraisal of your buy—but they will at least hold the thing up straight so that it can be looked at for a long time to come.

CHAPTER XXI

THE OUTSIDE FRAME—WHAT MATERIAL?

Affianced, my future wife and I went in search of an apartment. Able to pay no more than $30.00 a month rent, we looked first at the low-cost model tenements, built for people like ourselves.

We finally decided, though, upon an unhealthy two-room apartment heated by a smelly gas stove. It had a fireplace that worked every second Tuesday and a kitchen table-stove combination that let down over the bathtub when the latter was not in use.

The rent was ten dollars more than that for the model tenement with its sanitary cement floors and efficient kitchen. But it was worth it—because it was a home, whereas the sanitary apartment was a cell. Our shabby apartment had charm—the model tenement was convenient and efficient but its convenience and comfort had a strange resemblance to that of a dental chair.

Asked to build the tightest, most efficient exterior shell possible without regard to appearance or tradition, I should build of triple-ply tar paper supported by an inside frame of sheathing and 2x4's, just as farmers build their chicken houses—the animal, incidentally, above all others that cannot stand draft or cold.

This building that I should build as the ideal would be absolutely impervious to wind and water, perfectly insulated and quite sanitary.

Asked to build for my own family or to build to attract others, though, I should build of non-waterproof sponge-like shingles, of sun-baked mud, of cracked and porous stone, or even of ice, if I were an Eskimo, in preference to the structural ideal.

Initiated, I know for instance that New York office and bank buildings are neither wind nor water tight. I know that at least one is not sturdy and that the gargoyles on the corners have dropped so often that they are now held in place by chains. Still I also know that I would rent in one of these in preference to renting in a stronger but less heavy building recently erected in another part of the city.

Initiated, I know that the most fragile two-storied frame house is ten to twenty times stronger than necessary and will undoubtedly outlast me and my children. Yet I prefer to build for myself stone walls, one or two hundred times over-strong, walls that undoubtedly will still be here five or six generations hence.

I try to justify all this with logic—add crazy figures together to prove my point—only to arrive at the same conclusion: it cannot be explained by logic any more than I can explain why I like the smell of roses and hate that of carnations. That is just "me," and so also the selection of what your house is to be built of is five per cent structural value, five per cent design, and ninety per cent your own likes and dislikes, conscious and subconscious.

Viewed from the outside, small houses present many and varied combinations of materials. Actually, though, they divide very easily into three classifications.

First, we have the wood house with its wooden supporting frame covered on the outside by sheathing and building paper and then decorated with wood shingles, clapboard, stucco, half timber and stucco, or brick and stone veneer.

As ordinarily built, houses of this type are subject to damage by rot or termites and are completely ruined by fire. On the other hand, well built, they can be immunized against termites, can be made fire resistant, will last for from fifty to two hundred years and are absolutely wind and water tight because the decorative material is underlain with tar paper. Secondly, we have masonry houses of hand laid brick, stone, and concrete block. In houses of this type, the walls are free standing. Rot and termites may affect the inside joists and rafters but the frame itself cannot be damaged. Their age is unlimited, stone houses to our knowledge having survived four or five hundred years.

Their walls, thick and sturdy, imply strength and longevity. They lend themselves readily to fireproof construction by a substitution of steel for wooden joists and sash. But in all hand-laid masonry houses, time and the elements are continually tearing the bricks and mortar apart to permit the entrance of wind and rain. To avoid this, man has developed a system of internal waterproofing with tar and tar paper. His success, though, has been only partial, and he would have abandoned these houses long ago if it were not for

their personal appeal, an appeal so great as to require still that our dearest treasures—gold, religion, and our business—be housed in them.

Third comes the modern masonry house of concrete or concrete faced with stone.

These houses have all the structural advantages of stone and brick, lend themselves even more perfectly to permanent construction, and reduce the danger of entrance by wind, inasmuch as they reduce the joints between mortar and mortar, or between stone and mortar.

Among these three types, as you see, there is little to choose. A stone veneer house is actually a frame house painted with stone—it lacks solidity and strength but it is wind and water tight. A concrete house can be fireproof, wind and water tight, and enjoyable to your heirs six hundred years hence. But it lacks the conventional texture we have grown to expect, and its flatness we have learned to associate with cold, factory-like buildings.

Personally, my advice is to choose not by an analysis of the characteristics of the materials but by an analysis of your own idea as to what constitutes a home. If color, charm, and solidity are most important, your choice will be stone, hand-laid or backed by concrete; if daintiness and trimness are your aim, then frame with shingle or clapboard covering. Close your eyes; picture those things that mean home—that will be your answer —and no matter which type you choose, your builder can make it reasonably weathertight and sturdy.

CHAPTER XXII

THE RELATIVE COSTS OF MATERIALS FOR THE OUTSIDE SHELL

FIGURES do not lie—but liars figure. I warn you of this simple fact because, being fanatically fond of solid masonry walls of concrete or stone, I may in my enthusiasm be guilty of slight exaggerations in favor of my pets.

Before I start, though, I want to make it clear that the comparison is a purely academic one—akin to comparing the cost of an ordinary pen-point with that of a fountain pen.

Both write and neither is better than the other, unless you take advantage of the fountain pen's full possibilities by filling its storage reservoir with ink.

In other words, when comparing masonry houses of stone, brick, or concrete with frame houses, there is no particular advantage of one over the other unless full advantage is taken of all the possibilities offered by masonry which are not offered by frame.

Build a stone exterior if you will—for looks and sentimentality, line it inside with wood studs and wooden floor joists. The advantages of this house compared to

an all frame house are questionable except for appearance.

But build of stone or concrete and continue logically on the inside with steel joists and masonry partitions and you will reap the real benefits of masonry construction. Your home will be termite proof, crack proof, fire resistant, and everlasting.

How much "extra," you ask, would such a home cost?

Frame construction is unquestionably the cheapest standard method of building a home. Covered by wood shingles or clapboard, frame houses account for ninety to ninety-five per cent of our American homes.

Recently, however, a new school of thought has developed, backed by a new line of reasoning, which may change this practice somewhat.

The actual difference in cost per square foot of outside structure between frame and masonry is large. Masonry, in fact, costs one hundred per cent more than frame.

The exterior shell, though, represents but a fraction of the total cost of a building. The electric wiring, plastering, heating, plumbing, and flooring cost the same; and in masonry there is a definite reduction in the paint item.

Figured then on the basis of the whole, the importance of the cost of the exterior shell diminishes as the interior is improved with grander heating apparatus and more electric outlets, until today the difference in cost between frame and masonry houses of like interiors amounts to less than ten per cent of the total,—one

thousand dollars on a $10,000.00 house, or five hundred dollars on a $5,000.00 house, at most.

Of course, having followed my line of reasoning and decided that the difference in solid masonry construction is well worth the additional cost, you still have to take the next step to reap the full harvest; namely, steel or concrete must be substituted for the wood joists. All of this costs money—but perhaps not so much as you think, at least not so much but that it can be partially offset by economies gladly made once you have become infected with the love for solid masonry construction.

Cold to my arguments, though, I beseech you not to spend your money upon an inflammable frame house covered with a veneer of stone, brick, or stucco. The cost of any of these is almost as much as the cost of a free standing concrete or masonry house, considerably more than that of frame but with no structural improvement over frame to justify the increased cost.

CHAPTER XXIII

MASONRY—SHORT CUTS IN ITS SUPERVISION

I HAVE yet to find a mason who is not at one and the same time my best friend and the worst crook on the job.

Masons deal in permanent beauty and have a definite feeling for line and color—but they have an abhorrence for cement comparable only to a child's loathing for soap.

Building can be lots of fun when things go right, but it ceases to be funny if you always have to assume an attitude of suspicion.

At the office all day, tired and worried in the evenings, you must take advantage in the construction of this house of every agency organized and willing to assume the responsibility of supervision for you. You must, in other words, "pass the buck" to the limit.

If your cellar and side walls are to be of concrete, for instance, don't depend upon the mason for a proper mix; instead, insist upon his using ready mixed concrete and see to it that the mixing plant has proper instructions as to the proportions of cement, sand, and gravel wanted.

The use of ready mixed concrete not only assures you of a proper mixture but in addition gives you a daily check on the amount of concrete contained in the footings, the walls, and the floors, and permits Tony, the mason, to concentrate on its proper placement and disposition on the job.

If your plans call for brick or stone masonry walls, consider changing them to concrete and continue the same process throughout the building in an attempt to remove so far as possible the personal equation which can be so disastrous to hand-laid masonry. And if you need technical advice in making these adjustments or in writing the specifications, call upon the local representative of the Portland Cement Association or even your building inspector. Go to them frankly, remembering that their function is quite similar to that of doctors in clinics.

Recommended Concrete Mixes for Various Classes of Work

Masonry Side Walls Foundation and Cellar Walls	1 part Cement, 2½ pts Sand, 3½ pts Gravel
Floors	1 " " , 2 " " , 3 " "
Mortar for Brick or Stone	1 " " , 6 " Plaster Sand, 1 Sack Hydrated Lime

CHAPTER XXIV

FIREPLACES AND CHIMNEYS

I HAD the supreme pleasure not long ago of demonstrating the benefits of the much berated modern construction over the so-called "sturdy construction" of our forefathers.

In New England we have grown to fear chimney fires. This fear results from past experiences with old houses and their unlined chimneys too often pierced by wood beams.

Today our chimneys are lined with fireproof terra cotta flue lining enclosed in turn by six to eight inches of brick or concrete and the whole is free standing; i.e., neither supports nor is supported by any frame members.

Despite this, though, the fear bred from past memories remains with us. So when my neighbor came rushing to me for help the other day, saying the chimney in his new house was on fire, it pleased me no end to find I had faith enough to tell him that he had nothing to fear but sparks and that we might as well sit on the lawn and watch the fire burn itself out.

And so we did; and nothing happened, except that his chimney was effectively and economically cleaned.

Next most important "bugbear" to the amateur is the "smoky" fireplace.

Of course in tackling this problem you must realize first that there are certain conditions under which even Herr Hitler could not make a fireplace work.

No doubt you have noticed that, when an apartment is built next to a small house, the chimneys are extended by tin pipes to a point above the apartment roof.

The reason for this is simply to overcome what we call "back draft."

In such cases, back draft is caused by a wind blowing over the small house towards the blank apartment wall towering above it. The wind piles up against the apartment, builds up a pressure, and actually blows down the chimney taking with it any smoke or flame trying to go in the reverse direction.

Building in the country, you of course do not have apartments as neighbors. You do, however, have trees and hills or sometimes a higher wing that serves equally well to cause a back draft.

Under such conditions there is no sure cure except to carry the chimney above the obstruction or to remove it—difficult sometimes when it is the neighbor's tree or a young mountain.

Back draft accounts for fifty per cent of the smoky fireplaces; twenty-five per cent of them probably are caused by inadequate flues; and twenty-five per cent by faulty construction of the throat immediately above the damper.

Personally I leave the matter of flue size and throat design to my mason, who has yet to fail me.

Not quite so sure of your man, however, you would certainly do well to check up, and check up not by the application of a generalized formula found in a hand book, but by writing the damper manufacturer for his recommendations and design. In that way you may have a come-back if the fireplace smokes.

The materials of which the fireplace is to be built will no doubt be specified in your plans. If you, however, have a tendency to experiment, let me warn you: build the outer hearth of what you please, fringe the fire opening with tile, cement, or common brick; but when you come to the "guts" of the thing, i.e. the inner hearth, the back and the sides, use nothing but fire brick.

Stone may be more attractive, brick more artistic, but firebrick is the only material that stands up under direct flame contact.

CHAPTER XXV

MASONRY FLOOR COVERINGS— INSIDE AND OUTSIDE

The familiar masonry floor coverings are:

Cement—painted, plain, or colored
Bluestone
Slate
Tile
Brick

In cost, the cheapest, of course, is cement (about twenty cents per square foot), with bluestone and slate each two and one half times more, brick, laid in simple patterns, three times more, and tile from four to six times more costly, depending on the type of tile used.

Of these types, I do not approve of using any but cement and bluestone on the exterior of buildings, knowing too well that any and all of them are going to crack and "pop" with the frost and that bluestone in large chunks is the only one with sufficient weight of itself to keep a relatively firm seat.

All, except cement, of course, are uneven and when used inside are very noisy to eat on if the roast is tough and the knives dull. All are likely to sweat disagreeably

in August if the room is not exceptionally well ventilated. But all of them add a note of color and character to a house and are highly practicable as covering for porches, entries, dens, and children's play rooms.

I use them frequently in even the smallest house, and sometimes, when they cannot be included in the original budget and the plans permit, I lay at the start the basic cement coat, planning that the owner will add the top dressing in time to come, maybe in the next depression when tile goes begging and labor "sits and waits."

CHAPTER XXVI

CARPENTRY—THE WOOD FRAME

The difference between good and poor construction in the building of the wood frame is small. In fact, I doubt whether the difference in cost between a strong frame and a weak one amounts to more than one per cent of the total cost of the building—assuming, of course, that we are speaking of frame houses.

The difference lies in three directions: first, in a too sparing use of nails; second, in the use of undersized joists, rafters, and headers; and third, in the improper bracing of side walls and floor joists.

The difference does not lie, as so many people think, in the studding of the side walls themselves—not that a shoddy builder respects the side walls any more than the other parts, but merely because it is simpler and cheaper for him to apply the lath and set frames if he sticks to standard practice and uses 2x4's on sixteen-inch centers.

The matter of timber sizes can be checked easily enough by submitting your plans to the building inspector for an unbiased opinion. The matter of braces and nails, though, is pretty much up to you and the builder.

And that brings up the question of the contractor's attitude which I have already discussed. The bridging and the bracing are watched easily enough but it is impossible to supervise the driving of each nail. For that you must depend upon your contractor or his foreman, whose integrity should have been tested long since.

The amount of bracing is debatable. Err, however, on the side of safety. Insist that all corners be braced and that the outside sheathing be applied diagonally. Follow the same system inside by requiring that the rough sheathing floors be laid diagonally and the joists double-bridged with 1x3 diagonals on all spans of eight feet and over.

When you come to floor timbers, insist if possible upon girders of steel supported by steel channels or lally columns. This is not only for strength but prevents future shrinkage as well. Insist on oversized rafters and floor joists and insist that both first and second floor joists be set with an eye to reducing shrinkage by drying.

Besides taking these precautions, see that studs at all openings are doubled and that the lintels over doors and windows are calculated to carry the loads imposed upon them.

Satisfied that the skeleton frame is strong and sturdy, concern yourself with the installation of the doors and windows and the application of the outside covering. Be sure, for instance, that the rough openings have not been cut too large for their casings, in order to insure an absolutely air-tight job.

And when the outside covering is applied, be sure that the heads of all the windows are flashed with copper, and that the copper extends under the building paper and over the top of the window head.

If you persist despite my pleadings in applying a veneer of stone, brick, or stucco, be sure that the frame is covered first with a heavy two-ply tar paper well lapped and applied with galvanized nails.

Be sure that the metal lath over this paper is galvanized and that there is a sufficient number of anchors from the frame to hold the brick in place if it happens to want to lie down—and be sure openings are left at the bottom for the water that will inevitably leak through the bricks, to escape.

With the side walls completed, continue your vigilance to the roof. See that it is properly tight, that it has been insulated as specified and that the joints between it and the side walls have been packed carefully with mineral wool.

These precautions taken, I think you can trust your builder to handle the more technical details of firestopping, the installation and support of headers at stair and chimney openings, and the special preparations needed for trim and stairs.

CHAPTER XXVII

CARPENTRY—EXTERIOR TRIM

If you will look about you, you will find, I think, that the houses which have survived over a long period of years are almost never those houses having a large amount of exterior trim and extravagant doorways.

The reason for this is twofold: first, an excessive amount of trim, to be attractive, requires real artistry in its design; and, secondly, ornate trim with its large and curved moldings exposes the building to the deadly germ—rot.

In fact, I have found from my experience in repairing old buildings that usually it is the trim and the timbers behind the trim that need to be replaced and seldom the flat though large shingled side walls.

Therefore, in the interest of security as well as beauty, select a design as free as possible from heavy cornices, colonial columns, and ornate entrances.

But no matter how simple the exterior, you must also be careful in the selection of the material used for even the smallest exposed members.

Chestnut, Idaho pine, fir, cypress, and cedar are the only materials which should be used for outside trim,

painted or unpainted, and of these Idaho white pine, cedar, and cypress are to be preferred.

Oak and the softer Ponderosa pines are fit only for inside work.

Oak, the hardest, most lasting of our woods for inside floors and timbers, when exposed to the weather, can be destroyed completely in a very few seasons, and Ponderosa pine, even when painted, is no better.

Be careful then in preparing specifications or accepting lumber bids to see that any lumber exposed to the weather is adapted to it and that pine for the ridge, cornice, or corner boards is Idaho pine and not the softer pines which the "shyster" mills will try to substitute for it.

NOTE: Practically all the mills in the country fabricating entrances, wood sash, and wood frames are for one reason or another using Ponderosa pine. If the owner's plans call for extravagant entrances, he is going to find it extremely difficult to obtain these of Idaho pine. It is recommended, therefore, if he cannot obtain them fabricated in Idaho pine, that he consider simplifying the designs and having the work executed by the carpenter contractor on the job, using the better pines obtainable from the local lumber dealer.

CHAPTER XXVIII

ROOFS—WHAT MATERIAL AND RELATIVE COSTS

JUDGING by the reactions of many of my clients, the roof is the most important part of a house—esthetically and structurally. The roof, of course, is the hat of the structure—to them hats are important.

Hats are important to me too, although I myself have not owned one for ten years. Still I appreciate them on others, particularly on the female of the species. I like cute, saucy, little toques cocked to one side—what protection they are, though, I can't see. I like large, broad-brimmed ones too—but I wouldn't want to be caught in a wind with one. In fact, I like hats. They seem to me to cap the whole effect and so to have definite artistic value.

But when it comes to buildings, I object to artistic hats. Brightly colored coquetry seems to me out of place on a structure built to withstand ice, snow, and lightning—akin to putting a Poiret creation on the topknot of a Nantucket fisherman in his slicker and rubber boots.

Of course, this feeling is explained logically: hats can be taken on and off—roofs cannot. Hats are changed with the occasion. There are hats for fair weather, hats

for foul weather, there are spring hats, and winter hats, hats for bridge, and hats for golf. Wear the wrong one at the wrong time and you may look like something the cat dragged in. A roof, though, once laid, has to be endured through all the seasons and all weathers —colored a Mediterranean blue, like some Italian roofs, it would have to be endured in winter, even though it looked like September Morn at the North Pole. A roof, then, to look well at all times on all occasions must be of some age-old enduring material, a material which has become associated in our minds as able to withstand any weather, hot or cold, wet or dry.

That material is rock, which, interpreted in roofing terms, means slate.

When I go to select a suit, a hat, or necktie, I no longer ask the price of my selection so as to compare it with the other suits in the store. I have learned that what I like best is always the most expensive. Most people have the same feeling about roofing materials. Slate is their logical selection, their preference; consequently they assume that it is the most expensive and take instead horrible imitations: composition roofs with their bright, unnatural colors.

Slate roofs, of course, are expensive, cost two or three times what a wood roof would, but, strangely enough, in solid colors they are cheaper than the better immaculate conceptions of our roofing manufacturers.

Slates one-half to three-quarters of an inch thick laid to give the effect of a warm, woolly tam-o'-shanter, of course, cost a great deal more than wood shingles, but a roof of three-sixteenth inch No. 1 Black Bangor slate,

laid in the usual manner, will cost only six dollars a square (100 square feet) more than wood.

In selecting a roof for clients, I very often drive them past houses roofed with different materials. I find they have preconceived ideas of what they like and don't like. Before we have finished, though, they realize that there is a large group of roofs they have not noticed because they were simple and by their simplicity directed attention to the house and not the roof. This is particularly noticeable with stone houses—most people wishing to accentuate the color of the stone, select a colorful roof. A colorful roof, though, detracts from the stone beneath it. Exchange it for a solid black and see what happens. Every stone in the building below will stand out immediately.

The same principle holds to a lesser degree in all buildings: a conspicuous roof, even of natural materials, accentuates the roof, detracts from the building. In the interest of design, then, I commend solid colors—in slate, Pennsylvania black, Granville sea green, or purple.

Fearful of flatness implied by the words "solid color," let me reassure you that as they age, these natural slates fade and weather to a pattern just uneven enough to be interesting.

Recently, copper, lead, and zinc producers have been developing and marketing metallic roofs of one form or another. As a protective covering material, they of course are hard to equal—but when cost is the item to be considered, they are beyond an ordinary mortal's reach.

When your house finally is designed and the roof area known, your builder will be able to quote exactly on the costs of different materials. Until then, though, the following itemized list has been compiled to show relative costs per square (100 square feet) of roof. These figures are rough and include not only the roofing material, but also any additional material necessitated by the use of the material in question, as compared to a wood shingle roof as a base.

Up to this point, my discussion has been most unfair to wood shingles, the material with which my own house and most of the houses I have built are covered.

Some day when our ship comes in, my wife and I hope to cover our wood shingles with slate. Suppose, though, that day never comes. What then? Nothing special. This roof is good for fifteen years, costs nothing to maintain, keeps the house cooler in summer than slate would, and in the long run, will be very much cheaper than slate, which has a relatively high maintenance cost.

Some people, who oppose wood roofs on the score of the fire hazard, resort to the cheapest asbestos material. Personally, I don't worry, because my chimney flues are well cleaned, my roofs steep; but even if this hazard did bother me, I am sure I would be bothered even more by the looks of any fireproof roof that I could afford. Unable to afford the best in natural roofing materials, I have no other alternative than to use wood because to me the worst natural material is better than the best man-made article. Pictures are grand—but God's own, in the flesh, are always grander.

APPROXIMATE COMPARATIVE COST OF VARIOUS ROOFING MATERIALS

	Cost Per Square		
	Material	*Labor*	*Total*
Wood Shingles			
(Perfection red cedar)	7.00	4.00	11.00
Asphalt Shingles			
Light	4.70	5.00	9.70
Regular	7.50	5.50	13.00
Giant	10.45	5.50	15.95
Asbestos Shingles			
Regular	7.75	8.25	16.00
Heavy	12.00	9.00	21.00
Slate			
3/16″ Common Ribbon	8.00	5.00	13.00
1/4″ No. 1 "Bangor" (Green)	10.00	5.00	15.00
Rustic (Variegated)	26.00	7.00	33.00
Tile			
Galvanized iron	8.00	17.00	25.00
Copper	25.00	20.00	45.00
Clay	30.00	25.00	55.00
Metal			
Batten Seam			
16 oz. Copper	30.00	20.00	50.00
4 lb. Hard Lead	40.00	20.00	60.00
Standing Seam			
Tinned or galv. Steel	6.50	10.00	16.50
10 oz. Copper	14.40	11.60	26.00
16 oz. Copper	21.00	13.00	34.00

CHAPTER XXIX

INSULATION—THE VARIOUS TYPES AND THEIR USES

Some day I am going to rent a large warehouse. In it I am going to store the free samples of insulation that keep pouring into my office week in and week out. And finally, some day I am going to build a house insulated with these materials. I am sure I won't have to wait long.

Statistics interest me but I sometimes wonder how there can possibly be eleven million unemployed when I have definite proof that there are fifty million people manufacturing samples of these materials and at least another fifty million salesmen pestering me daily with their memorized chatter regarding coefficients and British Thermal Units.

Briefly, you can see what is ahead of you if you ever let on that you have not quite decided what insulating material to use.

Now insulating "as she is spoke" today by any of these salesmen is done in one of several ways:

1. By mirrors (metal foil backed papers).
2. By mineral wool or wood fiber bats. (First cousin to cotton batting.)

3. By quilting (either sea weed, mineral wool, or wood fiber quilted between two sheets of paper).

4. By wood fiber boards, structural or non-structural.

The salesman for each of these products will be inspired with the ardor of a religious fanatic. His material, no doubt, is good in its place and probably can be used profitably at one point in your building. If you follow his advice, though, you will use it everywhere. You may even be induced to experiment on its advantages as a breakfast food.

There is no "best" material for all jobs in the small house and yet there are very few materials which do not have a usefulness at one point or another.

Returning to the four types mentioned, the following is, to my mind, an intelligent analysis of their application to the problem at hand:

1. THE MIRROR TYPES OR HEAT REFLECTING INSULATORS: (that is, paper covered by aluminum or copper foil.)

These materials, particularly the copper clad type, can scarcely be improved upon as a protection against air leakage when applied between the shingles and the sheathing.

By the same token they offer possibilities in air proofing floors. As insulators against heat transmission, their efficiency is honestly questioned.

2. THE WOOLS, MINERAL OR WOOD FIBER IN BULK OR BAT FORM:

These most excellent materials are being sold and used in large quantities throughout the country as an insulating material for the side walls and roofs of new and old buildings.

In the case of old buildings, bulk mineral wool is blown into the side walls through a few holes cut near the roof.

In new buildings it is manually packed rather densely between the outside studs before lathing. In the case of old buildings its use cannot be avoided, because there usually is no other way of accomplishing the same result, short of removing the entire outside shell. In new buildings, however, I cannot recommend its use.

Houses breathe and sweat in the space between the plaster and the outside wall. If air circulates in this space, the sweat dries; if, however, the space is packed with wool or some other material which blocks circulation, rot is apt to occur.

If bulk wool, mineral or fiber, is used, therefore, it should be battened or held back from the plaster to insure the circulation of air. This, of course, is an extra expense, an expense not warranted since the same materials are available in the quilt form, which automatically accomplishes this result.

But when your house is finally enclosed and supposedly tight, you will be surprised to find how many spots of light there are at the eaves, the sill, and about the windows. It is in these spots that bulk wool renders the best service. Have them all packed generously with wool and for safety pack the entire

eaves line as well and any other points too small to be tightly covered by the blanket materials. In other words, poke her ears full.

And, of course, I need not remind you in your choice of wools that the mineral type is fireproof, vermin proof, termite proof, and rot proof, whereas the wood fibers are wood "and ever will remain so."

3. THE QUILTS come in rolls four feet wide or in sixteen-inch strips to be applied between studs, rafters, or joists, and consist of a loose insulating material stitched between two layers of paper. I find them invaluable for side wall and roof insulation.

In roofing I apply the wider material direct to the rafters prior to the application of the sheathing or roof boards. In this way I get a tighter job than I would if it were applied inside. Once in a while, though, the quilt is damaged by rain when nature is in a non-coöperative mood, so others prefer the other method. On the side walls quilt may be applied between the studs on the inside or as a blanket between the sheathing and the outside covering material.

4. And, last but not least, we have the INSULATING BOARDS OF COMPRESSED WOOD OR SORGHUM FIBER.

These materials can be had in three forms: first, as three-quarter inch structural board to replace the sheathing; second, in large sheets to be used as quilt on roof and side walls; or, third, in small sheets as a plaster base. Personally, I do not advise the uninitiated to use the three-quarter inch structural board. It is still too new.

The other two types, though, I recommend without reserve, the large sheets for permanent blanket insulation applied as quilt plus the smaller sheets as plaster base or a reserve line of defense in the battle to save coal.

That then is the story, not very complicated nor hard to understand.

You know from actual experience that blankets alone are of no use unless they are carefully tucked in at the feet and shoulders and you know that there is no colder hell in this life than a well blanketed bed with a leaky mattress. Exactly the same conditions exist in buildings, and if you deal with them logically, you will be rewarded, not in heaven, but right now in greatly reduced coal bills and a comfortable home.

Don't be bothered about co-efficients. Use plain "horse sense" and follow your nose.

CHAPTER XXX

TERMITES

BUILD as we have in the past and you may be singing that song of Gilbert and Sullivan, "Some little bug is going to get you some day."

The termite is no longer something one hears about but never actually sees. Like prosperity, it is just around the corner—but unlike prosperity, it is making definite progress toward you and your house.

Cure and prevention are two entirely different problems in termite control. The cure is complicated—beyond the scope of this simple book. Prevention, though, is as simple and effective as mosquito netting was effective in eliminating malaria and tropical fever.

Effective prevention is based on one simple characteristic of the termite; his Achilles heel is his insatiable thirst. To live, he must return from his work in your timbers to the ground at least once every twenty-four hours—understandable when his diet is nothing but sawdust.

Cut off his liquor supply and you then are free of the termite.

This is done most effectively on the inside of the building by covering the whole area with at least two

inches of concrete. That will protect the joists and the inside frame.

Some claim that termites can come right through concrete. Well, they can't—they can come through holes in concrete, though, just as you and I can. It is important therefore that there are no sticks in the concrete and that the concrete is well compacted.

Do this, and your building, if it is of concrete or solid stone, is safe. But if it is veneer, frame, or stucco, you must in addition prevent the entrance of termites to the sill by encasing it in copper with a turned up lip to keep them from getting back to the ground for a drink if they do gain entrance to the building.

This done, you must be sure that the door sills do not have "Welcome" written all over them. In fact, having covered the larger points, do not rest on your oars until you have investigated every point where wood comes within eighteen inches of the dirt—porch columns, storm entrances, etc. Remember you are not dealing with a very particular guest. Be sure your builder has blocked his every entrance or exit by copper, copper-plated paper, or concrete.

CHAPTER XXXI

WINDOWS—STEEL AND WOOD

WINDOW sash and frames divide into two main groups: the double hung or guillotine type and the casements, inside and outside opening.

Without question, the former, that is, the guillotine type, is the tightest and warmest and up to this moment has been the cheapest as well.

Casement windows are proverbially bad actors. The inside opening types are impossible, leaking both air and water, and the outside opening, while tight to water, leak twice as much air as the worst fitting double hung sash.

Wood casement sash are to be had in two thicknesses, the thin emaciated 1⅜″ type found in summer cottages and the healthier kind which are 1¾″ thick, used by the better builders.

Up to recently, estimates which I have had prepared for me, taking into account the exact cost of the necessary hardware and the labor in fitting wood sash, have shown invariably that the guillotine type (to be had only in wood for the small house) is the cheapest window, with steel casements a close second, followed by wood casements as the highest priced.

Now, though, with increasing lumber and labor costs, the steel casement has taken the lead and may be expected to become comparatively cheaper as time goes on and its production increases.

Add to this fact the fact that stock window frames almost invariably are made of the soft short-lived pines rather than Idaho pine, adapted to outside exposure, and wood sash of any kind become an extravagance, not an economy.

CHAPTER XXXII

CARPENTRY—GENERAL INTERIOR TRIM

The term "interior trim" is a general term used to define all woodwork, with the exception of the floors, that is exposed in a building when it is finally completed.

It includes, in other words, the door frames, door frame casings, and the doors themselves.

It includes the trim around the windows and the window sills.

And it includes the baseboard, the base molding, the picture molding, and any ceiling cove moldings. It also includes bookcases, paneling, drawer sets, or any built-in cabinets as well as mantels, or stairways; in fact, any and all woodwork exposed for decorative or utilitarian purposes.

Most modern American houses are rather heavy with it in a form known as the "Colonial" style and it has become quite the usual thing for speculative builders to pare down hidden essentials in an effort to conform to this mode.

Personally, I do not approve of this practice and believe we would be better off to return to the cheaper, simpler idea of a home, the idea possessed by the builders of our Early American homes.

Early American houses were conceived and built by individuals laboring under conditions quite similar to those of the average young couple today.

The men were busy in shops, forests, or on farms, eking out a small but growing income for the family. They had neither time nor money to waste upon a home and yet they, of necessity, had to provide some kind of shelter for their wives and families.

Their usual procedure was first to assemble and whittle the timbers for the structural frame. When these were ready, the shingles and siding on hand, the neighbors were invited to their popular version of our modern cocktail party which lasted until the frame was completed and the building wind and water tight.

The guests departed; the host proceeded to finish the interior, room by room—and with crops on the one hand demanding attention, and his wife and kids on the other, restless to occupy their partially completed home, you can see why the interior finish in these houses was limited to the mere essentials, consisting usually of cheap material crudely tacked in place.

This frank approach to the problem was effective, effective artistically because of its simplicity.

I believe that it is a procedure which most of us should follow when we build—perhaps not in the whole house—but in a part at least; and so I frankly outline it in the full knowledge that you probably will commence changing it the day you move in. That is as it should be.

The first item on which I wish you to save is the item of paint. I want to substitute one coat of stain for three

coats of paint, and to do this, I must change my baseboard and door jambs from evenly grained clear pine to cheaper knotty No. 2 white pine with its more interesting grain pattern.

Another and equally important reason for this change from paint to stain is the fact that paint is a fairly modern product—certainly beyond the reach of our early craftsmen. Stain, therefore, is less likely to conflict with the primitive type.

In the interest of material and labor saving, under this system, all trim is applied prior to plastering. The base consists of a simple 1x4 board with back beveled upper edge to form a key for the plaster and is applied directly to the studs. The door jambs, stair stringers, pine paneling, window stools and jambs, are all applied in the same way. They not only finish flush with the plaster but serve, as well, as guides to which the plasterer must work as he floats the finish coat.

Under this system, once the plaster is dry, the carpenters have only to lay the finish floors, hang the doors and windows, erect the kitchen cabinets, the book cases, and trim the door and window openings, to complete the building.

Trim applied in this fashion has, of course, one serious drawback; that is, there is bound to be a crack between wood and plaster wherever they are butted together and the joint left uncased.

Wherever possible, therefore, as in the case of the door ways, I use a narrow 2½″ White Pine molded casing or a simple 1⅝″ White Pine one half round.

But the crack between stair stringer and plaster, and the base and plaster, cannot be so simply corrected.

Our forefathers were not bothered by these cracks because their houses were not equipped with modern heating plants and, in my experience, the effect of the heat is not serious if the householder will make a reasonable effort to humidify the atmosphere. It is, however, a difficulty you should expect, one that can only be corrected when the house is completed by installing a humidifier or "finishing the trim."

To go the whole "hog" with this type of trim, one should abandon modern paneled doors and take to the old plank batten door with its "H" and "L" wrought iron hinges.

Batten doors, however, I do not recommend; they shrink, swell, and warp, and afford no more privacy to the occupants of a room than a lace curtain. Besides, they cost three to four times as much as a better-made stock panel door.

In self-defense, therefore, and in the interests of economy, I use with this trim the standard six-panel door. It is cheap and at the same time good looking, and is, in fact, the same patterned door—with its "cross" guaranteed to keep witches out—that our forefathers used to replace their batten doors as rapidly as they could afford to buy new ones.

For paneling in dens and living rooms, I use the same No. 2 White Pine in random width boards with a "V" or molded joint to camouflage the crack that I know will develop between them.

And here I must warn particularly against paint. The

crack cannot be stopped and will be disagreeably noticeable if the paneling is painted. Back the paneling with wall board prior to its application and stain it and you will have a paneled effect at a cost not much more than that of ordinary plaster.

In studio living rooms or any other points where it is structurally honest, I expose the heavy carrying timbers in their natural form.

These timbers can be of oak or chestnut. In the interest of economy, however, I ordinarily use stock fir timbers redressed at the mill to remove the saw marks; I find them quite as good looking and in better harmony with the pine doors than any of the more expensive hard woods.

This system, as I have said, gives a definitely primitive effect, foregoing fancy wallpapers or delicate moldings, all right in itself, but perhaps not what you want throughout the house.

I recommend, therefore, that you consider each room separately.

If, for instance, you wish a scenic paper in the dining room, visit your lumber dealer and select a truly beautiful paneled wainscoting with door and window casings to match, and spread yourself a bit on this one room.

Or perhaps you want to paper your own bedroom or even the living room. Then, at the same mill, select an attractive one half by five inch base, to be laid over the primitive one already applied, as well as casings to match.

Or if you have reached the end of your financial rope,

hold off and add these later. They certainly are not as important as many other things which cannot be done later.

And finally, commence to look about you and make notes on your friends' houses. You will be surprised at what you have not noticed. In fact, I think you will find that the houses you think have such attractive interiors produce their effects, not by noticeable trim, but rather by a selection which melts into the picture—"is seen but not heard," so to speak. As you learn what it is that produces a pleasing effect for you, include it in your specifications plus perhaps an experiment or two of your own.

CARPENTRY ACCESSORIES: BOOKCASES, CORNER CABINETS, AND MANTELS

CABINETS and bookcases can be made an integral part of the building itself or they can be applied after plastering as accessories.

Personally, I like cabinets built flush with the wall, with batten doors; corner cabinets with triangular shelves that hold nothing, and ornate mantels that serve no useful purpose, irritate me.

The built-in types, however, are more expensive, more expensive because they are not factory made. You probably will have to avoid them.

I suggest, therefore, that when you come to the finer details in your plan you go over the assortment of cabinets, mantels, etc., carried by your lumber dealer. See whether their stock designs don't include many items you could use.

And in planning these details, particularly the bookcases, be careful about sizes. Cut out pieces of paper to scale to represent your furniture and arrange your rooms and their accessories so that the furniture will fit into the spaces provided for it.

Be careful, because otherwise you may have to cut a foot or two from the couch when you move in.

CHAPTER XXXIV

KITCHEN CABINETS

All good parties end up in the kitchen—but that is not a sufficient reason for expending the entire family exchequer on fancy cabinets that work no better than the cheaper, more standardized ones.

To attract attention, apartment house owners and the speculative real estate operators invariably spread themselves in the kitchen.

The game is identical to the shell game, only, instead of pushing you in the nose or stepping on your toes to distract you, the operator uses kitchen cabinets to cover up more serious deficiencies in other directions.

Personally I like dainty be-cabineted kitchens, but given the choice between an ordinary house with extra grand cabinets and an attractive well designed one with no less practicable but cheaper cabinets, I know which I should select and I know which would be worth more five years later. The one thing is so vitally important, the results so permanent; while the other is so transient in its effect that they are not comparable.

In fact, in perfect honesty, I consider that any one, building without an architect for economy, who spends

more than seventy-five dollars on cabinets in the kitchen, is an idiot.

I beg of you then to control yourself and investigate all the various types of cabinets carried by the lumber mills, and finally make your selection with an eye to keeping this item down to one-half to one per cent of the total cost of the building.

FLOOR COVERINGS—CARPET; LINOLEUM; TILE—RUBBER, ASPHALT, OR CLAY; WOOD—PINE, OAK, OR FIR

So many apartment owners and speculative builders in the past have advertised "Oak Floors" that people in general have become accustomed to thinking of them as an extra special luxury. Whereas, as a matter of fact, standard oak flooring in the narrow widths is very little more expensive than the less durable fir and pine for use in the small house with its wood joists.

Given some extra special condition, for instance a house with steel joists or concrete floors, and one of the expensive floorings may prove cheaper than oak or the unsatisfactory pine.

Each type of flooring, in other words, is adapted to one particular job. Each can be forced to fill the rôle of another, but always at a price.

Narrow wood floors account for eighty per cent of the flooring on the interior of the average small house. This is true because they are ideally suited for use on the usual wood joist.

They shrink and swell somewhat but laid, as they always should be, over a rough floor of sheathing with a

layer of heavy paper between, they are quite satisfactory —not draughty or dusty as they might be if laid singly.

Wood floors in narrow widths can be had in many grades: selected, select, apartment house, etc. Each has qualities superior to the others so far as appearance is concerned, but all grades of each genus have approximately the same wearing quality.

It is, however, my duty to warn you of one large difference: namely, the difference between "flat grain" and "edge grain"—especially important in the softer pine or fir floors.

Edge grain flooring is flooring sawed so that only the edge grain is exposed on the wearing surface. Flat grain, on the other hand, exposes the face of the grain to the traffic. Trees being conical in shape, it gives in each board a series of grain lines beautiful to look at but sure to lift and splinter with drying—to say nothing of wearing unevenly with time.

Flat grain flooring is cheap, serves quite as well as edge grain when covered by linoleum, rubber tile, or carpet, but should never be used as finish floor, unless, of course, you have no respect for your toes and the hands of the person delegated to clean them.

And by this sweeping condemnation, I hope I have also dug the grave for that relic of "Ye Olde Cottage," the wide pegged floor—oak or pine, which some people still hanker after and which builders and architects abhor.

Floor manufacturers from time immemorial have been experimenting to find a method of inoculating or mesmerizing wood against swelling or shrinking. Might

as well try to make a subway train odorless. It can't be done.

Every once in a while, though, a new experimenter breaks forth with the "finished product" backed by the indorsement of the technical laboratory of some large university.

Naturally they essay the hardest problem first and announce a wide board flooring which will not "come and go."

Some ten years ago "I bit" on one of these new floors, put it in a house in New Haven, and for safety, I tied it down with some two thousand-odd screws.

One hot July day I received a telegram telling me my nice floor guaranteed by the manufacturer not to "come and go" had, despite that, gone many places and knocked a baby off her high chair in the process, and besides scared her stiff as it buckled with a pistol-like crack.

And if they don't buckle in July they shrink in January. Thank you, no! I don't want wide floors, mountainous in July, slotted in January. I, too, was "born to dance."

After wood, the next most important flooring is linoleum.

Linoleum, rubber, and more recently cemented carpeting, all must be laid over wood for the greatest satisfaction. And on this wood underfloor depends the lasting quality of the final finish.

Linoleum, in other words, is nothing but a light veneer which is laid over a finish floor almost as expensive as the best exposed wood floor in the house.

To be sure, the basic floor need not be oak, should in

fact be flat grain fir. It must, however, be as securely nailed as oak and on its freedom from ridges depends the smoothness and lasting qualities of the whole.

Linoleum can be had in three grades: standard, medium, and heavy.

To me it is always somewhat of a shock to find large manufacturers labeling their lightest, poorest grade as "standard." One wonders why they should wish to play so neatly into the hands of the shabby builder.

In plumbing, for instance, the light unsatisfactory grade of soil pipe is labeled "Standard Weight." In linoleum, the lightest grade is also called "standard."

"Standard" linoleum in quality of material is no better, no worse than "medium." But it is so thin that its life is too brief, to my way of thinking, for anything cemented to the building.

Be careful then wherever linoleum floors are used to specify at least "medium" gauge and, if you are buying ready built, investigate.

If the linoleum manufacturers have failed us in labeling their goods, they have not failed in prescribing methods for its proper application.

If you intend to use it, write to the Linoleum and Felt Base Manufacturers' Association for directions; incorporate them in your specification and see that they are followed.

Next in importance to linoleum in the floor coverings are rubber tile and asphalt tile; the first, more expensive than linoleum; the second, considerably cheaper.

Rubber tile has had a checkered life. No doubt it is a wonderful material and when well laid is more lasting

than linoleum. I regret, however, that I am not able to recommend it.

Asphalt tile, originally recommended by its manufacturers for use on cement floors only due to its brittleness, is now being produced in heavier grades, recommended for use on any base—wood or cement.

Asphalt floors on cement I recommend without reservation. On wood, however, I prefer to defer a recommendation until further testing establishes its value.

And now cemented carpets have arrived at a cost no greater than that of good linoleum.

I don't know what to think. Suppose the carpet becomes infested with fleas. What then? I am not sure that I like the idea.

Turning now to coverings for cement floors, we have first, asphalt tile as the cheapest; second, linoleum as questionable unless the concrete is especially treated (see manufacturer's recommendations); third, clay tile, the last word in lasting, soul-satisfying floors.

If your house has steel joists or if your house is cellarless, these floors can be used at little or no extra cost. If your house, however, has wood joists, they are out of the question.

Asphalt tile, as I have said, costs no more than oak when laid on cement. It can be had in various colors and patterns and should find a real outlet in small houses.

Given my choice, though, of all flooring materials and I should take the baked clay tiles. The quarry types, if limited by my budget, the Grueby Faience if there is no limit.

They sweat disagreeably sometimes in midsummer, but they have a comeback possessed by no other material.

Our children's living room, for instance, is floored with heather brown quarry tile.

The kids roller skate on it, pound it with hammers, and sparks from the fireplace may spatter it. Most of the time it looks "like the devil." A few strokes of an oil mop, though, and there it is—"good as new."

That, then, in a couple of nutshells, is the flooring problem. Oak is unquestionably the cheapest, most generally used; asphalt tile under special conditions can be as cheap; while linoleum in all cases is an "extra"; regular clay tile while nice is perhaps a luxury, a luxury, however, quite as easy to justify as a fur coat.

CHAPTER XXXVI

SOUND DEADENING

The study of sound transmission is a science by itself. In the studios of the National Broadcasting Company in Radio City, under the guidance of Mr. O. B. Hanson, we find its teachings set into effect on a scale never equaled before.

In these studios a brass band playing in one studio is unheard in another, not ten feet away.

I don't profess to know how it is all done—

I do know, however, that you or I cannot hope for such perfection. Lack of funds, if nothing else, will prevent it.

In a building, sound is transmitted from room to room by three routes:

First, it comes through keyholes and cracks under doors; second, it passes through plaster or boards; and, finally, with these routes blocked, it hops from plaster to nail, nail to stud, and stud to plaster.

I don't know just what proportion goes by each route though I have a suspicion each carries about one-third.

For complete sound proofing all three must be blocked. An expensive process. However, content with

incomplete results, one can block one route at small expense, thus reducing the noise by one-third.

When any one tells me to sound proof a room, I must know what he means by sound proofing. Does he insist upon the elimination of all noise or does he aim merely to prevent the transmission of intelligible sounds and so avoid involuntary eavesdropping?

Rooms can be partially and inexpensively sound proofed, for instance, by packing the partitions with mineral wool. This eliminates the thirty-three per cent that filters through the plaster. Thirty-three per cent will still come through the keyhole, though, plus another thirty-three per cent hopping from nail to stud, etc. (telephoning they call it).

If packing with mineral wool is not satisfactory, we shall have to build double partitions between the rooms so that the studs of one room do not touch those of the next—expensive and especially so when you realize that the same process must be followed with floors and ceiling.

And if that still is not enough, we shall have to install indoor weatherstripping—effective but costly.

And besides these are many experimental alternatives; for instance, quilt laid between floors, ineffective in ninety-nine cases out of a hundred and liable to produce a squeak of its own.

If, however, you build of masonry and install steel joists covered with concrete, you create an entirely different set of conditions.

The partitions, to be sure, are no more sound proof than the lighter frame ones. However, they are heavier

and consequently less resonant to the normal high-pitched tones of high heels and human voices. With them, automatically and at no extra expense, comes a thirty to sixty per cent reduction in sound transmission —an item worthy of consideration in preparing the original plans.

HARDWARE—ROUGH AND READY OR FANCY

HARDWARE is another one of those items which spell the difference to the layman between good and bad construction.

He reasons, of course, that here at least is something he can feel and see. What more natural then than to assume that, if there is expensive hardware, the same degree of excellence has been followed throughout a building to and including those items that cannot be seen.

He reminds me of my little daughter who worships the person of Tom Mix because he is so kind to the women and children in his pictures.

Hardware manufacturers are now set upon a campaign for "bigger and better" hardware for American homes. Seven per cent of the cost of a building, they claim, should be spent on hardware.

Spend that much, they claim, and you will have balance. Spend that much, I claim, and your house will look like the interior of a modern automobile which I think should be equipped with an appropriate chro-

mium plaque bearing the inscription, "Hardware by the ——— Casket Company."

Seven per cent is too much. But three per cent is worse still.

Budget your hardware at seven per cent and you can have solid cast brass knobs and locks that close and shut with that dull precision associated with expensive custom-made automobiles.

Reduce the hardware allowance to three per cent and you get hollow spun brass instead of cast knobs, and locks that function well enough, but with that shade of difference which exists between the crunch of healthy teeth on tough beefsteak and the hesitant nibble of badly fitted false ones.

So instead of spending seven per cent on ornate and mechanically perfect hardware or three per cent on a conglomerate mass of paper weight brass gadgets with iron "guts," I recommend that you spend no more than two per cent on a newer line of dull black thumb latches. And by doing so, you will make, in addition, a considerable saving in the item of the labor required for installing them.

Hand made wrought iron latches with hinges to match are costly. Furthermore, being hand made, they function imperfectly and rust badly because they lack the rust resistant finish of the machine made product. But in competition with these, there is a line of machine-made thumb latches no less good looking and costing but forty cents each.

Combine them with standard butt hinges and black mortise turn bolts for locking purposes and you have

the hardware for a door at less than one dollar—compared with two dollars a door for cheap key sets or two dollars for the knobs alone of superfine lock sets.

Of course you have many hardware items in addition to the locks for the inside doors. Today, though, with prefabricated steel sash and kitchen cabinets equipped by the manufacturer, the hardware for the interior doors represents better than fifty per cent of the total finish hardware, leaving exterior door hardware and door bumpers as the major items to be included.

I have no particular recommendations to make regarding these except to suggest that you follow through with the same basic idea: select for service, ruggedness, and general good looks, avoiding "de-brassed" or false hammered effects.

The saving in dollars and cents will not be great. Two or three such savings on inconsequential surface items, however, might permit of radical improvements in the frame of the house. They might, for instance, offset the extra cost of steel floor joists or sound proof masonry partitions between rooms.

CHAPTER XXXVIII

PLASTER AND PLASTER BASE

If you have reached this point in your building operation you know without being told how "cockeyed" this so-called building business is.

You, no doubt, were quite enthusiastic when the roof was completed, the insulation installed, partitions set, and the rough floors laid. It all looked so grand and "ship shape."

At about that point, though, the electrician, plumber, and heating contractor arrived with pry bars and saws to install their gadgets.

Out came joists, studs, and ragged patches of flooring. Holes were bored and rafters whittled hither and yon until you wondered whether eventually your house would have a sponge-like appearance and give this way and that in a heavy wind.

In due course, though, the carpenters get it pinned back together and swept clean in preparation for the next bunch of hoodlums, the plasterers.

Can you imagine a joint convention in heavy marching order of the Ladies' Sewing Circle and the Sign Pasters' Union? and in what a mess the place would be after two days? Well, I can give no better description

of what your house is going to look like when the lathers and plasterers get into full swing.

And they call this an Industry!

But it cannot be avoided. Hundreds of manufacturers and inventors have developed wall boards, waterless plasters, and other materials in the hope of eventually correcting this trying condition, but plaster, applied just as our forefathers applied it, is still the cheapest, most satisfactory finish for the interior walls of a building.

Dispute this if you will and instead use a patented wall board as final finish. Before you are through you will find that the cost of the board plus the labor in erecting it equal the cost of plaster, and that the cost of covering the joints, plus the cost of the material wasted, bring the total to ten to fifty per cent more than the older, more conventional plaster finish which costs only twelve cents a square foot, including plaster base, plaster, and the labor of applying them.

The term "plaster base" is used to describe what used to be known as lath and is any material which, nailed to the studs, serves as a vehicle to hold the plaster in place.

The earliest material used as a plaster base was wood lath split from logs four feet long.

It gave reasonable service but, in office buildings, has slowly fallen into bad repute because it is not fireproof and, in small houses, because newer materials have been developed which insulate as well as lath at little or no extra expense.

These insulating laths which are nothing but one-half-inch wood fiber wall board cut into strips measuring

4′0″ x 2′0″ are sold under many names and represent, I believe, even without taking their insulating value into account, the finest plaster base we have today.

These fiber boards must be applied carefully, all corners must be reënforced with metal lath and joints made only on studs or joists.

Applied in this fashion, they serve as no other plaster base I have known.

Wood fiber boards, though, are costly, even more costly than metal lath. It is not surprising, therefore, that a cheaper substitute has been found and this is what we call the "gypsum or plaster board." It consists of a three-eighth-inch pre-fabricated gypsum slab with the surface contacting the plaster covered by paper.

Boards of this type fall quite naturally into the "almost as good" class. Their insulating value is about half that of the wood fiber boards and while they serve satisfactorily enough as a plaster base, they should never be used at points in cellars or garages where dampness might loosen the pasted bond between their gypsum core and paper covering.*

The metal laths are as numerous as the fleas on a dog's back and included among them, quite naturally, are many that should be handled just as fleas are.

I recommend, however, that you use them where fire-

* Quite recently a new perforated gypsum lath which quite effectually corrects this difficulty has come on the market. If you finally elect to use one or another of these boards as a plaster base, I should suggest that you write the manufacturer of the particular board selected for directions for its application and that you make these directions a part of your specification.

proofing is necessary or is required by the building code, or where dampness might cause trouble with either gypsum or fiber boards, as, for instance, in the cellar and laundry or on the ceilings and inside walls of porches and passageways.

And with the quantity limited in this way, I advise you to use only the best and most expensive types. See that they are rust proof and completely imbedded in the plaster.

And finally, when the lathing is completed, inspect it carefully for badly supported lath, poor joints, or missing reënforcing at the corners.

And then make a final check-up on the electric outlets and all other openings to see that they are in their proper places. When that is done, permit the plasterers to start work.

Plaster, as you have come to know it, is applied in three coats and has an overall thickness including the lath of three quarters of an inch.

The first two coats known as the scratch and brown coats respectively are composed of one part gypsum plaster (sometimes called patent plaster) and two parts sand. The final coat, known as the white coat, is composed of one part plaster of paris to three parts slaked lime putty.

For purposes of economy in later decoration and to achieve a more interesting finish, I usually omit the white coat excepting in baths, kitchens, and rooms to be papered.

I do this by having the browning coat worked to what has come to be known as a "Sand Finish."

Of course if you prefer it, the mason can mess up the plaster, giving it a half-baked Greenwich Village finish or one of those dripping surfaces characteristic of Ye Taverne or Ye Goodie Shoppe. For my part, though, I prefer simple, straight, sanded walls.

As the plaster is being applied, I doubt very much whether you will be able to offer any helpful suggestions except to see that the brown coat is applied while the scratch coat is still wet and that the white coat is not applied until the brown is dry and that all surfaces are worked to a straight smooth surface of correct thickness.

And when the plastering is complete, close the job down for a few days until the plaster dries and for at least four days after it is dry to permit the studs and joists to return to their normal sizes. During this time, turn on the heat generously with windows open, particularly at night. Remember air, not heat, is the drying vehicle.

BATHROOM AND KITCHEN WALL COVERINGS

TILE used to be the accepted finish for the walls of bathrooms. Its supremacy in small houses is now being questioned and the next few years, I believe, will see it displaced by a more plastic material—probably linoleum.

Tile is an ideal material for hospitals, apartment houses, and hotels. However, being inelastic, it does not wear well when carried by the shrinking wood joists of the small house nor does it fit so well into their general decorative schemes.

So during the past few years dozens of new materials have been developed to take its place, some good, some bad, some cheaper, and some much more expensive than tile.

Arranged according to cost the individual materials group themselves as follows:

Enameled Plaster
Waterproof Paper on Plaster
Common Paper Fiber Wall Board
Compressed Wood Fiber Wall Board Painted or Enameled

Metal Tile
Linoleum
Compressed Wood Fiber Wall Board with Baked Enamel Finish
Asbestos Tile Board
Ceramic Tile
Plate Glass

There is no such thing as a "best" among these materials. One or another of them may have a more general application than the others, but all of them have usefulness, and for each there is one combination of circumstances to which it is ideally suited.

Considering them separately, the following are their credentials:

ENAMELED PLASTER:

Cheap, washable and fairly durable.

Incompatible with showers or children who shake themselves dry.

Excellent finish for maid's baths or week-end cottages but hardly acceptable as a finish in master's baths in houses costing more than $5000.

WATERPROOF PAPER ON PLASTER:

Low cost, washable, and fairly durable.

Not much better than enameled plaster in showers or over tubs equipped with showers.

Very "natty" for lavatories and most effective for giving a boudoir-ish finish to the bath, when combined with a material like linoleum over the tub or shower.

COMMON PAPER FIBER WALL BOARD ENAMELED:

This material, associated in our minds with its use in the country general store, must live down its scandalous past, I fear, before I can recommend it for permanent homes. It, however, is easy to apply so is ideally suited to week-end cottages or summer homes.

Does not mix well with showers because it disintegrates on continued exposure to water or steam.

COMPRESSED WOOD FIBER BOARD PAINTED:

Reasonable in price, washable and waterproof.

Applied with aluminum moldings in either solid sheets or tile embossed sheets, it produces a most attractive bath; it is not possible to disguise the fact, however, that it after all is a wall board.

Can be used with safety in showers, though corners must be provided with molding set in plastic cement.

The cheapest material which does not depend upon its painted surface for its waterproof qualities, it therefore should be everlasting.

METAL TILE:

Reasonable in cost, washable and durable.

The metal tile is set in plastic cement on white plaster. Can be had in various colors.

Ideal for use on kitchen walls, where metal stoves, etc., keep it company, but entirely too "tinny" for use in baths.

LINOLEUM WALL COVERINGS:

Medium cost, washable and durable.

Applied on white plaster or wall board with water-

proof cement and aluminum moldings, ideal for showers and "splashy" children.

Can be had in embossed tile effects or in patterns resembling an aërial view of the wake of a giant airliner crowded with air sick passengers.

Or at a slight extra cost and *if you insist,* you may use *light weight* floor coverings in the same way.

These can be had in a great variety of most attractive solid colors.

Like the little girl with the curl, linoleum wall coverings can be very, very good or they can look like h–l, depending upon the choice of patterns.

Select attractive solid colors and you automatically have an effect which is distinctly good. Use the imitation tile patterns and you have just that—an imitation.

COMPRESSED WOOD FIBER WALL BOARD WITH BAKED ENAMEL FINISH:

Costly, washable, durable.

Excellent for showers if corners are waterproofed.

Very fine material when subjected to abrasive wear, as for instance on the walls of the bargain basement in a department store, but of questionable value in the small house.

ASBESTOS TILE BOARDS:

Costly, washable, durable.

Excellent for showers if corners are waterproofed.

Repeat the preceding comment in a slightly larger dose.

CERAMIC TILE:

Costly, washable, not durable on wooden joists.

Excellent for showers.
Can be had in all colors and combinations of colors.
You cannot go wrong in its use, though it does lack originality.

PLATE GLASS:

Very costly, durable, washable.
Excellent for showers.
Requires special layout by manufacturer.
Fit for queens and movie stars but a little "high hat" for the medium priced house.

Reviewing these recommendations, you will note that the only materials recommended for the side walls of showers are those materials which in themselves are waterproof.

The reason for this is simply that, despite the waterproof surface, some water is bound to penetrate to the back of the material, via the joints, causing destruction quite as effectually as though it had gone through the front.

CHAPTER XL

ELECTRICAL

For some reason the electrician is always the strong silent man on the job.

His overalls are clean, he washes behind the ears, and he comes and goes without the fuss and bother so noticeable in the activities of the other trades. The glazier for instance, spreads glass clippings and paper tabs over everything and shrieks about the job in a voice as squeaky as his glass cutter.

The electrician appears just three times: first, to install the rough wiring and outlet boxes before the lathing is commenced; second, to make the necessary temporary connections for the oil burner during plastering; and, third, to set the fixtures and make the final test.

He usually spends two or three days on the roughing, an hour or two to make the temporary connections, and a day to hang fixtures; or a total of four days at the most, on a $5000.00 house.

His greatest expense is material, not labor. A wide divergence in bids, therefore, invariably means substitution of cheap bootleg goods for the better safer materials manufactured by our largest producers.

The electrical system in any building is composed of two distinct parts: the service and the house wiring system.

The house wiring system consists of the complete outlet boxes, switches and base plugs, the wires connecting them to the fuse box, and the fuse box itself.

The service consists of the wires from the fuse box to the main house switch, the switch itself, and the wires or cable from the switch to the lighting company's lines on the gable of the building or underground to the nearest pole.

Overhead wires are not exactly beautiful even though they make nice landing fields for our feathered friends, but so long as underground services of equal size cost sixty to seventy dollars more, I guess you and I will continue using them as we have in the past.

Whatever you do, though, insist upon a service large enough to carry your ambitions as well as your present load. Make it large enough to carry the future stove, garbage grinder, and bathroom heaters. Otherwise you may be throwing good money after bad.

In laying out the outlets in the house, follow the same principle and provide for possible needs. Remember each outlet without fixture costs $2.50 to $3.00. Save if you must, but make your savings by reducing the number of switches and fixtures and not by reducing the number of base plugs or utility outlets.

Switches are nice and side lights come in handy when one is chasing a lost poker chip or a stray cat but for every minute that they are used, the floor lamps, radio and clock plugs register hours.

Personally, in planning the outlets for a new house, I allow an average of five outlets per room counting baths and hallways as rooms. If, in the end, they total more or less than this number, I go back to see whether I have been overgenerous or too penurious.

It is the electrician's duty to hang the fixtures. It is the owner's to furnish them.

Here again one can spend a fortune or a pittance, and here again I have no objection to either, though anything in between is terrible.

Years ago, I built a house for a real estate agent. He furnished the fixtures and he thought he had done a grand job.

After a while, when the house did not sell, he came to me wondering why the brokers were complaining about the light fixtures for which he had paid one hundred and fifty dollars.

The house was a gracious colonial type and in the front hall was a crystal chandelier that he had bought for $12.50.

With his permission, I removed this fixture. In its place I put a simple pewter butter plate fixture costing $2.50.

The complaints about fixtures stopped and the house sold for more than twenty thousand dollars.

In other words, a fixture should be a work of art. But since works of art cannot be had for $12.50 or even $125.00 each, the fixtures must be frankly inconspicuous and devoid of any cheap drippy attempt at decoration which will attract attention to its shortcomings.

And when you, as an independent owner, come to

buying your fixtures, be advised that you, as a builder, are entitled to the builder's discount. It is yours for the asking. See that you get it.

And with the fixtures in place, the wiring completed, insist on an Underwriter's Certificate from the electrician. If it is possible in addition, with the building inspector as adviser, see that the whole system has been installed properly, that circuits are not overloaded and that the ground wire and the cables, the fuse boxes, etc., have all been installed properly and that the materials and equipment have been approved by the Underwriters for the uses to which they are put in your building.

CHAPTER XLI

PAINT AND PAPER

In discussing trim, I called attention to the fact that a saving in the cost of the lumber could be made when the interior trim was to be stained instead of painted.

The saving, however, is not limited merely to the item of lumber but is reflected as well in the painter's contract, since stain is a cheaper material than paint, is applied in one coat instead of three, and can be applied more successfully over rougher unprepared woodwork than either paint or varnish.

In preparing your specification, therefore, if economy is your aim, substitute stain for paint wherever possible.

In doing this, you must remember that stained woodwork is not waterproof in any sense of the word. Stain preserves by disinfection, not by protection.

Woodwork treated with stain "comes and goes" almost as badly as untreated and twice as much as painted wood.

This is important when you come to finishing doors which connect a painted with a stained room. Treat the two sides differently and in a very few weeks your door will resemble Robin Hood's bow.

In other words, you can't mix drinks if there are any straight lines to be walked.

This difference in the materials argues rather effectively against the use of stain for outside doors, screens, and windows. It does not, however, prevent its use for simple cornices and exterior moldings where swelling and shrinking are of no moment since they do not open or shut. And it does not prevent its use on interior paneling, molding, or doors which, even when painted, are only partially covered. Base and paneling, for instance, are covered only on one side and doors only on the surface, leaving many unpainted spots that are hidden by moldings through which moisture enters and escapes.

Stain, therefore, applied in one coat, is a practical finish and a finish which can be improved by frequent waxing and polishing if at first it seems a little rough.

But stain is tiresome when taken in heavy doses, reeks of boarding school, and has no standing in kitchens, baths, or rooms to be papered. Here one must resort to flat paint or enamel, applied in two coats over a priming coat of shellac. Your painter will, of course, know how to apply it, but it will be up to you to specify the prime of shellac and the number of coats to follow.

Floors, of course, require a different finish. Subjected to heavy wear, paint is impractical and stain alone is too porous and dusty.

Their treatment, therefore, involves a staining followed by shellac as a filler and wax as a final finish.

Floors of tile, slate, or linoleum can be waxed or lacquered. If lacquered, they assume the glassy stare of

a dead fish; if waxed and rewaxed they gather a sheen and depth impossible to imitate by any hasty surface treatment.

As I am absolutely color-blind, and a man besides, color effects and how to produce them are beyond my ken.

But I do understand balance and feel quite definitely that we have learned to expect things to grow lighter in tone as well as in tonnage as they go up. Floors, for instance, should be darker than the walls, and ceilings should be lighter than the floors. Be careful on this score; otherwise your room, if it has a dark ceiling and light floor, may reproduce the effect of a thunderstorm, without your knowing just why.

Having covered the decoration of woodwork in a broad way, we come next to the plaster: rough and smooth.

Rough plaster can be painted with oil or the cheaper, more modern so-called "casein" paints which come in the powder form and are mixed with water to any desired consistency.

Personally, I have no use for the oil paints on rough plaster, not only because they are more expensive and must be applied over a glue sizing coat, but also because they fail to give a velvety tone to the plaster and because, being thin, they fail to cover the imperfections in the plaster itself as completely as one thick coat of casein paint.

And for the same reason, I object to paint applied directly to smooth plaster—and in the living quarters, insist upon an undercoat of muslin.

So-called "smooth plaster" is applied prior to the laying of the flooring and the hanging of the doors in a building.

Quite naturally, it gets nicked and when it finally reaches the paint stage, cannot be classed as exactly smooth. It then is patched and smoothed and proclaimed ready for paint. When enameled, the surface is satisfactory for kitchens and passable for baths but hardly suitable for the formal walls of dining rooms, living rooms, and bedrooms, where every inch of wall is a part of the decorative scheme and is not intended to include barnacles or miniature craters.

I mention this because, although I am in favor of economies, I believe in economy by substitution of equivalents in quality—a small horse for a bigger one, perhaps, but never a moth-eaten beast for a husky brute.

So in the kitchen and in the bath I recommend, with reservations, white plaster enameled. If you insist, however, on smooth painted surfaces in the living quarters and won't take the cheaper but no less serviceable sand finish, then you must be prepared to pay for your taste by first covering the plaster wall with muslin. That gives a smooth, continuous surface as a background for paint.

The only alternative to this procedure is to use paper, plain or decorated, and the painter should agree to apply it instead of paint at no extra cost—providing you furnish the paper.

With these items settled, your painter, I believe, can line up the details for you but before doing that, you should understand painters and how they figure.

Given a plan, a painter makes an even more detailed estimate than a carpenter. Each item is figured and each item not to be painted is omitted.

The total cost of these items plus a profit large or small is the price quoted you.

It is important then, if you wish to be fair, that every item of work be carefully listed in the specification down to and including the moth-eaten kitchen chair that your wife wants touched up.

Having done that, though, don't be surprised at complaints and grumblings. Don't be easy on that account. I have come to assume that these mumblings are what is known as "painters' colic."

I admit that the painter on any job gets a "raw deal." He no sooner gets one room finished or swept but what some one messes it up for him. He gets all ready to stain a floor when a flock of plumbers tramp over it. And Sundays the owner goes around sticking his fingers into things to see "if it's dry yet."

Any one foolish enough to be a painter, however, deserves just that. Painters know it and seldom are disappointed in their expectancy. So they take it out in grumbling.

Another irritating trait possessed by painters is their inability to see things. I swear that if by any chance your car were parked on the side of the building, the painter would paint right over it, claiming later that he had not seen it.

And the worst of it is that his protests will be so sincere as to make you feel in error.

Understand him, though, run your nose ahead of every brush stroke, and you will be good friends.

Insist on the brand of paint selected by you; insist that surfaces be sandpapered and cleaned before painting; insist that the proper number of coats be applied and that the unseen tops of sash and doors be painted; and he will give you a grand job.

Be lenient and your job will look like patch work with the painter flatly denying responsibility for anything, any irregularities, or what is known in the trade as "holidays."

CHAPTER XLII

PLUMBING AND PLUMBING FIXTURES

The plumbing system in any house quite naturally divides itself into, first, the hot and cold water feed pipes; second, the waste disposal or sewer pipes; third, the porcelain or enameled iron fixtures; and, fourth, the chromium faucets and exposed fittings.

Of these items the least important is the water piping and the most important—because it affects your health—is the sewer piping.

During the past years, our copper and brass manufacturers have covered the matter so thoroughly that I think it unnecessary to say more than that the use of galvanized iron water pipe is inadvisable and that water pipe leading to bathrooms should be larger than any of the branches from it to the fixtures.

But when it comes to sewer pipe, I doubt whether you realize that there are two types: the so-called "standard" which is used quite regularly in country towns; and the type known as "extra heavy" which is the only type permitted in towns or cities having a building code.

I also doubt very much whether you are competent to lay out or judge the system, the method of trapping

and venting to be employed, or to superintend the testing of the whole.

I therefore advise you to depend upon your building inspector for approval or disapproval of this work and to make this a condition of the contract with the plumber.

And if you build beyond the range of a building inspector, go to the nearest town and see whether you cannot obtain the services of one for five or ten dollars on an "off Tuesday." It will be worth the cost and may perhaps prevent future sickness.

With piping attended to, you have next to select the fixtures and fittings to go with them.

About four years ago conventional fixture houses began to get competition from a new source: the automobile body makers, who, with dozens of huge presses idle for the moment, experimented with sinks and bath tubs, enameled and finished as our cars are—only better.

These are now in production—undoubtedly "going places."

But to you I advise caution. They are still too new and the saving made by using them too small to be worth while in houses costing five thousand dollars or over.

The bathroom is distinctly an American institution. Houses are bought and sold on the strength of them.

It is important, therefore, that you conform in this respect and go your neighbor one better, if possible, in the glorification of the American bathtub and toilets that are "seen but not heard."

I therefore suggest that you visit the nearest show-

room of one of the three large fixture companies and select there the usual fixtures, to and including the kitchen sink.

Select them and insist upon being given a specification to include in your plumbing contract and in this specification have the fittings—i.e., the faucets and traps—included because it is through these fittings that a crafty plumber can, by substitution, make an illegitimate dollar.

And finally, in the selection of your plumber, be particularly careful; don't be satisfied with anything but the best! Remember this item represents better than ten per cent of your total building cost and ninety per cent of the work is concealed, non-inspectable when the house is done—and darned expensive and inconvenient when it doesn't function.

SHEET METAL

To THE tinner falls the job of making you wind and water tight at all your various joints and junctures.

And to the tinner also falls the job of installing leaders and gutters to catch rain water pelting down upon your roofs.

The name "tinner" of course is a misnomer, because today we would not dream of using anything but copper for either flashings or gutters.

Again I am going to advise putting off a non-essential until later. Gutters and leaders are nice but not necessary—they protect base planting from the drip from the eaves and they protect the sides of the building to some extent but they can be added at any time at very little extra expense.

Postpone them, therefore, and spend the money on improving an item that cannot be changed later: steel joists instead of wood, for instance, or an extra foot added to the living room.

Flashing, though, is a horse of a different color. It is or should be done once and for all.

If done properly, it is a blessing—done badly or

penuriously, it will be a source of trouble for all time to come.

The important spots to be flashed are, of course, the dormers, valleys, and chimneys; in frame houses, the heads of all doors and windows, and in fact any flat or flattened surface where water is likely to collect and cause rot or leaks.

Copper, window glass, and tar paper, you know, are the only waterproof materials in a building. Concrete, brick, stone, or shingles merely shed water. Be sure, therefore, that any horizontal surfaces or any points—as behind a chimney—where water may build up, are well covered with copper. And above all—be sure that the flashings in stone or brick chimneys extend far enough into the masonry to catch and deflect any water that has penetrated from above.

SUMMER AIR-CONDITIONING—WHEN?

THE invention of air-conditioning was the invention of a word, not a machine or a process. It was merely a word, probably invented by an advertising man, to describe a heating system developed by a textile manufacturer which not only maintained the spinning rooms at 104° F., but in addition maintained them at a constant humidity of 90%. (Oh, for the life of a textile worker!)

Inspired by this idea, shocked by summer ticket sales, our movie magnates experimented with the same idea but *different* numbers.

Refrigerating machinery had to be substituted for heating equipment, to be sure, but the change was a mere substitution of one advanced, well-developed machine for another, a substitution which brought no surprises nor embarrassing situations.

Impressed with the comfort that these conditioning plants promised on hot August and July nights, home owners raised a hue and cry for them. One president (an engineer who should have known better) predicted that the boom in business due to the introduction of air conditioning into small homes would finally pull "old

man prosperity" around the corner. Apparently something has gone amiss: prosperity is here but summer air conditioning is still out of sight.

When you go to the movies, try to figure out what your share of the air in the theater amounts to. I think you will be surprised to realize that you are entitled to about four hundred cubic feet for two hours. At home, though, you require nearer ten thousand cubic feet for twenty-four hours—quite a difference!

It costs a hotel fifty cents a *night* to cool a small, tightly battened room. Then how much would it cost to cool your generously proportioned home with its leaky doors and windows?

Some day homes will be conditioned. But when the change comes, it will come not as a result of improvements in machinery but because man has decided that home is a place to hang one's hat—nothing more. If one wants to change one's mind, stretch, or hear the birdies sing, one will go outside where there is more room and air.

Families of three or four will be crowded, in refrigerated comfort, into homes no larger than trailers.

Individual privacy will be maintained by freedom of thought, and individual comfort by an electric blower, a refrigerator, and a thermometer. Summer air-conditioning will be accomplished. Science will have triumphed again.

CHAPTER XLV

WINTER AIR-CONDITIONING—OF WHAT DOES IT CONSIST?

A YEAR-ROUND air-conditioning system would, according to dictionary definition, be any combination of machines which maintained a room or building at a constant temperature and humidity regardless of the conditions surrounding the room or building. Summer air-conditioning, we know, is impossible, but how about winter air-conditioning?

A winter air-conditioning system, then, is any machine or combination of machines that maintains a building at a constant temperature and humidity during the heating season.

It would be composed of

(1) A heating system.

(2) A humidifier.

The heating system can be hot air, warm air, steam, hot water, or hot water bags if you prefer; the only requirement is that it shall be adequate to maintain the building at a uniform temperature.

Likewise, the humidifier can be a spray chamber set in warm air ducts, a humidifying steam radiator, or

just wet towels—who cares, so long as it humidifies, is automatic, and reasonably noiseless?

Of course the warm air people would have you believe, if only you will, that humidifying is somehow indissolubly tied up with their method of heating.

This is far from the truth. In fact, proper humidifying under all conditions is impossible in a warm air heating system designed, built, and operated as it is today.

In a warm air heating system the air in the room, when it gets cold, is drawn to the cellar, is reheated, and at the same time washed and rehumidified. It is then returned to the room fresh and clean.

Give a large party or kindle a fire in the fireplace. The air in the house does not get cold, consequently no air is shipped to the cellar. Air-conditioning ceases—just when you need it most to absorb perfume and smoke.

Heating and ventilating, to be sure, must perform in concert to produce air-conditioning but for best results they should perform independently, not in duet.

There has been so much hokum built up around this problem that one is loath to go the whole way and say what one really thinks. It is absurd, too absurd, to believe that a seventy-dollar apparatus can give equal if not better results than one of the more formal machines costing from two hundred to two thousand dollars.

But, given my own home, this is what I should do:

First, I should install an adequate oil burning radiator heating plant.

Second, I should install a humidifying radiator on the first floor in a good central location.

Desirous of more refinement, I should install an electric motor valve on the water line to the humidifying trays and thus prevent a needless waste of water.

The whole would cost less than one hundred dollars and be the equal, so far as results are concerned, of the more elaborate systems costing several times more.

If you have plaster cracks, openwork floors, and rickety chairs, you have no one to blame but the arid heat in your home. In summer, especially if you live near the shore, the air reeks with humidity—boards and timbers sponge it up, swell to a hundred and ten or a hundred and twenty per cent their normal size. Winter comes and they are subjected to conditions not equaled in the drying kilns. The shrinkage may amount to an over-all change of one and a half inches from cellar to garret, a change which has nothing whatever to do with the condition or type of lumber originally installed —a change due entirely to conditions imposed upon the material after the building was erected.

Homes in which proper humidifiers have been installed do not suffer in this way. Plaster cracks do not open, floors do not squeak or shrink, and chairs remain sturdy. The resultant saving in painting, in cleaning, yes, in the very life of the building itself, is considerable —enough to more than pay the bill.

CHAPTER XLVI

HEATING SYSTEMS—A GENERAL DISCUSSION OF THE MODERN IMPROVEMENTS IN ALL THREE TYPES: HOT AIR, STEAM, AND HOT WATER

The first question a client usually asks his architect is "What kind of heating system do you recommend?"—a question akin to asking a doctor which one of his medicines he would recommend as a sure cure for anything and everything.

During the past year, I, for instance, have recommended and installed all three of the principal types of heating systems and never expect the time to come when one will displace the others for all conditions and classes of jobs.

To be sure, I have a preference. Given no limit as to price, no other special requirements, I should invariably choose hot water heat plus an air conditioning unit. What you would like in this world, though, and what you get are two different things. Or maybe you don't need to be reminded of that.

What our *now* "ragged" individualists would have us know as "the American way" has worked perfectly in the case of heating equipment. In fact, it is hard to

imagine any incentive other than competition that would have worked so well and produced such grand results.

Standing on the side lines is as exciting as watching a basketball game and baskets are scored so frequently by both sides that it is difficult at any one moment for even an expert to tell which has the advantage.

I speak, of course, of the continuous state of war which exists between the warm air and the radiator people, and of the sectional wars in the ranks of the radiator people: one-pipe versus two-pipe steam, and steam versus hot water.

To understand the issues and results, one must know the facts and not be misled by advertising nomenclature, newly designed uniforms, or a change in name by one team, after a series of severe drubbings, to avoid a jinx.

Men about to bet on a horse arm themselves with dopester sheets, they study past performances, and father and mother traits, then place their two dollars and a half as science directs. When they select a heating plant, however, they consult romantic pictures of man and wife chewing gum on a linoleum rug in the cellar, and then place their five hundred to one thousand dollars on a hunch backed by solid facts—about color and name.

In my younger days, this highly intelligent system of selection used to ignite a long series of skyrockets in my reformer mind and result in terrific outbursts of sarcasm directed at the advertising fraternity. Today, though, I have become more reasonable, so much so

that I will admit that, except for the products of a very few manufacturers, the difference between one and another of the systems is not the difference between good and bad but merely that shade of excellence that separates the better from the best—the difference between Cal Coolidge and the Sphinx as tablemates.

In other words, not particularly interested in attaining perfection or following my long winded reasoning, you will be well served if you will leave the design, layout, and selection of your heating plant to any one of the large and reputable heating concerns listed in the telephone book. For this very service these companies maintain large engineering departments that, unfettered by outside opinions and foibles, will deliver an economical and workable plant one hundred times out of one hundred times. They fail, however, when behind them stands a kibitzer owner as excited and unable to keep his own feelings secret as a child when his Christmas gifts to others are wrapped and put away.

So I continue, not to protect you from swindlers, but to give you a background of information which will make you a helpmate and not a hindrance to the engineer to whom you inevitably must turn for the final decision and layout.

Man's first attempt at a heating system consisted of a simple pot-bellied cast iron coal burner set up in a central room on the ground floor and served by the kitchen chimney.

With the passage of chewing as a gentlemanly art and farming as a means of livelihood, home owners

searched for a means of ridding their crowded living rooms of the bulky stove and at the same time utilizing what had been a useful storage space for farm products —the cellar.

It took only an ingenious tinner to solve the riddle. Down cellar went the stove with a tin hood built around it to direct and carry warm air by gravity from the stove to the room above.

It was a mere matter of time then before additional lines had been run to Aunt Sophie's room and eventually to every room in the house to and including the bath which was added in 1906.

Thus was born the hot air heating system which sounded the death knell to "bundling" and ice-cold bedrooms.

It didn't take long, though, for a new batch of "kickers" to organize. Very often, you know, a man formerly content will be started on a long career of complaints by a five-dollar raise.

Despite "moistening" trays that didn't moisten, gorgeously decorated registers that more often than not didn't register anything, and automatic control devices, the public was not satisfied because it was impossible to arrive at any regularity of performance.

On windy days, the systems didn't work at all. On damp days, dependent upon rheumatic old man gravity, they worked sluggishly. And last but not least, Sarah the hired girl, with the highest register in her attic room, controlled the whole situation, could if she wished toast her limbs in lonely solitude while the family froze.

To cure these ills, some more directive system was needed. To that end the hot water heating system was invented. What was more natural than to substitute for one fluid,—air, another—water?

The old furnace was discarded and in its place came a cast iron boiler which consisted merely of a firebox enclosed by a water-tight jacket.

From this jacket individual pipes were run to individual radiators placed at points where the heat was most needed.

With this system came partial bliss. To be sure, the radiators were as large as upright pianos and not much better looking; it was "as slow as molasses in January," and its cost shocking to people who regarded $100.00 as the top price for a means of locomotion.

The reason for the high cost was, of course, the fact that two pipes to each radiator were necessary for circulation and the radiators and pipes had to be excessively large with a system in which the heating fluid reached a temperature of only 140° F.

To correct these difficulties, the first steam plant was invented. Using the same type but a slightly larger boiler (steam and hot water boilers of all manufacturers differ only in this respect) inherited from hot water, with smaller but similar radiators and with only one pipe to each radiator, the first installations were made.

Compared with what we have today, they were truly remarkable animals, although the name "heating plant" was a misnomer.

To be sure, they were an improvement over hot water in price and like hot water they "had it" on the hot

air plant in that they definitely put the heat where it was wanted and also were independent of the weather.

On the other hand, they leaked, spit and hissed at every joint and needed as much attention as a new born baby.

Fed by but one pipe and without modern automatic air valves, the old-fashioned one-pipe steam heating system gave no heat in the radiators until the air trapped in them was let out manually and until they had been bled of condensed water; besides which, unlike hot water, they gave no heat with a slow fire. But they were cheap.

Anxious to please, our engineers then developed the two pipe system and later the so-called vapor system. Both of these systems sought to retain the advantage of steam's speed and small radiators, and, to add to these, the regularity and controllability of hot water, and to give the customer a system superior to hot air because it was directive.

The cure effected by these two-pipe steam systems, though, was worse than the pain. They were intricate and expensive and required the services of a Philadelphia lawyer when they got out of "whack."

There was a time when they were quite popular. Today, however, they are as naked of advantages as a burlesque strip-girl is of clothes, stripped by automatic oil burners, vacuum air valves on one-pipe steam systems, and motor circulators on both hot water and hot air.

That, then, is a brief résumé of the chapters of heating history which precede the period being lived and

to be lived by you and me or any one planning to build in the next few years.

It was now the hot air manufacturer's move. So far, his best efforts had been topped, and, with very few chips left, it was up to him to produce or quit. He moved; and ever since, the heating world has been in a dither. He first abandoned gravity circulation by installing blowers. In this way, the irregularities caused by the weather were eliminated. Next, he made his system recirculating—that is, he not only blew air into the rooms but he at the same time installed return suction lines from each room to the blower. In this way, he succeeded in giving direction and control to his heat.

Not content with these revolutionary changes, he added a humidifying and filtering unit to the furnace, thus creating not only an improved heating plant but a heating plant which conditioned the air as it heated.

And to insure success for his new team, he gave it a new name and a new uniform.

The new uniform was a beautifully enameled square box with neat rectangular ducts. The new name was "the air-conditioned warm air heating system."

Of course, the ink on the publicity of these nefarious warm air heating men was hardly dry when every radiator and boiler manufacturer in the country started to scream at the top of his lungs "I seen it first!" Possession, though, is nine-tenths of the law and try as they have, they have not been able to overcome the advantage gained by the warm air people when they "copped" the name "air-conditioning."

The improvement, though, was more than the gain

of a name. The re-christened, re-designed hot air furnace with its conditioning unit, controlled circulation, and directed heat was the first satisfactory low cost heating system, designed for small houses, that equaled in any way what had come to be expected of office or apartment building heating systems. It not only was automatic but it definitely attempted to make the air fit to breathe and work in—something the radiator people had neglected to provide.

And that brings us to 1935. It is the hot water engineer's turn to make up for lost time. First, he develops a conditioning unit to be used either as an integral part of the radiator installation or as an entirely separate coöperating unit.

Next comes low cost, inconspicuous recessed radiation, and, finally, as though that were not enough, a motor circulator and a flow control valve are added to the system thereby making the one boiler plus an oil burner serve not only as a heater for the house but a heater for domestic hot water as well.

The steam fellows then follow with the same recessed radiators and air conditioning units—plus controls that permit their one boiler to act as house and water heater, plus adjustable three port vacuum valves that automatically control "robber" radiators and insure even heat throughout the house, a feat until then impossible for one-pipe systems.

And that is the situation as of January, 1936, with you and me to tally the score and select the winner.

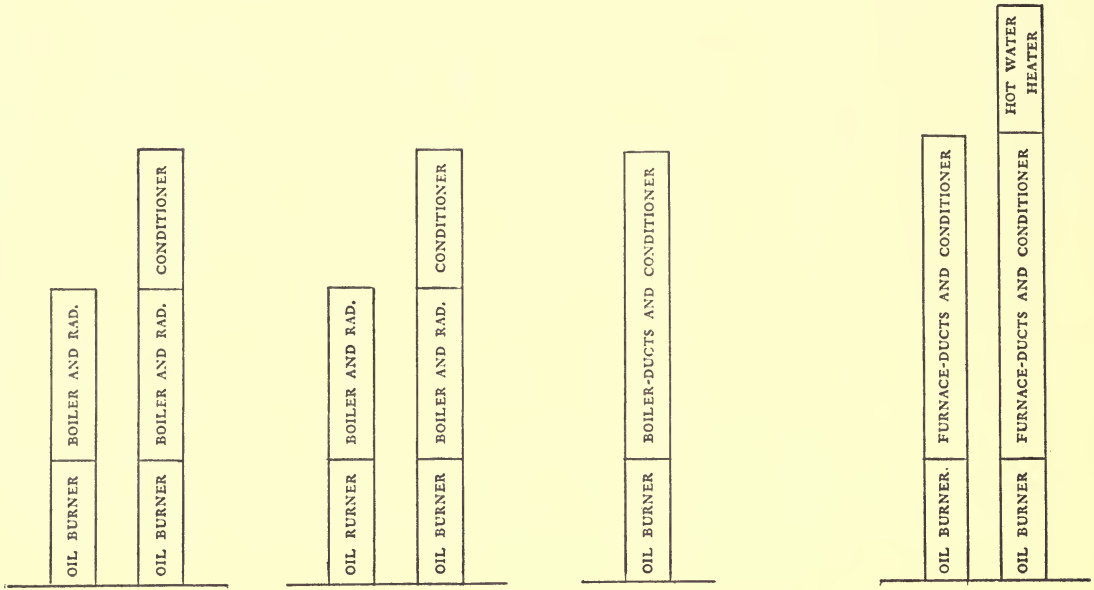
RELATIVE COSTS OF VARIOUS TYPES OF HEATING SYSTEMS WITH AND WITHOUT AUXILIARIES.

Year round domestic Hot Water can be had from these types without an auxiliary Hot Water Heater.

An auxiliary Hot Water Heater is necessary for Summer use.

These Heating Systems can be had with or without Air Conditioning.

Winter Air Conditioning equipment is an integral part of these systems.



CHAPTER XLVII

THE HEATING PLANT—THE FINAL SELECTION

At this point in the process, a gypsy fortune teller would rightfully foretell that you were going to have callers—not one but dozens, all heating equipment salesmen; and each with a pencil and pad, prepared in his enthusiasm to prove that his equipment can do anything that the other fellow's can—plus several things more—at half the price.

If you had engaged an architect and still listened to these fellows, he, quite reasonably enough, would have become irritated. Being your own boss, of course, it is up to you. My advice, though, is to hang out the "out to lunch" sign and put your problem before the engineering department of one of the old, more conservative radiator companies—and abide by its decision.

My reason for this advice, quite frankly, is merely that you are not qualified to make the decision for yourself. And if you think that statement a little smug, understand that there are very few architects who don't follow the same procedure and for the same simple reason.

The final selection of a heating plant is not simply a

matter of saying to a plumber, "I want steam," or "I want hot water heat."

In isolated cases, with plans presenting no special problems, and with a heating contractor as pure and honest as new blown snow, this might work. It might result, on the other hand, in your getting almost anything but a satisfactory job.

For instance, on page 165 I have tried to show graphically the cost relationship for steam, hot water, and warm air heat.

On the face of it, there are but three variables. In order to make honest comparisons, however, I have had to develop seven costs to compare three systems.

This, of course, is occasioned by the fact that air-conditioning is an integral part of warm air systems—an accessory to steam and hot water heat; and year round domestic hot water is included automatically in steam and hot water systems but requires an auxiliary heater in the case of direct warm air.

But suppose I had continued along in my cost chart with all the other hundred and one variations of materials and sizes. Imagine then how complicated it would become.

For my own part, life is too brief for such nonsense.

Instead, armed with my plans and specifications and a general knowledge of the subject, I lay the whole problem in the lap of any of the heating manufacturers carrying a complete line of boilers, furnaces, radiators, and valves.

I express my client's likes, dislikes, and financial limitations and depend upon the manufacturers to produce

from their kits a combination best adapted to produce results. And it is their recommendations that I neatly tabulate and type into the specification. Offhand this policy may sound careless, a little too trusting. On the contrary, it is the essence of conservatism and the surest method of insuring absolute satisfaction.

This is true because, first, having limited myself to one manufacturer who is able to furnish all types, there is no question of his using cheap substitutes to beat competitors; second, able to furnish any type system, he is not likely to give me a square peg for a round hole; and, third, prepared by engineers, the recommendations, I know, will contain nothing but facts—facts honestly arrived at.

WHAT FUEL?

Gone are the days when father went forth with Rollo and his faithful ax each morning to whittle a cord of firewood for the kitchen stove and the fireplace.

Gone also are the days when the family froze as daddy nursed a hangover or a spell of the grouch.

Now daddy and the whole family lie abed and complain bitterly if their architect asks them to have a look once in a while at the furnace to see that it has oil and water.

That being the case, there is hardly any use in my arguing for the economical but bothersome fuel coal; even though fired in the modern magazine boiler, it is still the cheapest fuel for heating a house. It is the cheapest, but, requiring as it does feeding and cleaning twice a day, it hardly fits.

I am left then, in this discussion of fuels, with stoker-fired coal, burner-fired oil, gas, and electricity.

Of these, electricity is the ideal, an ideal, though, which will not be realized until electricity can be had at less than three-quarters of a cent per kilowatt hour.

If you are mechanically-minded, the robot-like coal stokers that do everything a human fireman can do ex-

cept spit and wipe the sweat from their brows, may interest you.

They not only fire the boiler the year round with seven-dollar coal but also can be designed to help themselves from the coal bin and spit the ashes out into ashcans at the ground level.

And if you wish, they can be arranged with lights to notify you when more coal is needed.

The interest and maintenance costs on all these gadgets offset the fuel saving and, though these systems are convenient, they are no more convenient than gas or oil at the same or lower cost.

So then you come to the two major combatants: Gas vs. Oil.

British Thermal Unit for British Thermal Unit, gas and oil don't compare so well in cost. Gas, for instance, of the ordinary manufactured variety, should sell for twenty-seven cents per thousand cubic feet to compare with oil at six cents per gallon, on the basis of the heat content.

As gas usually sells for nearer sixty cents, the gas man has quite a spread to account for. He is prepared, however, with answers galore.

First he argues that an oil burner costs more than a gas burner and an oil burner being mechanical depreciates and antiquates itself to death in ten years. True enough.

Next, intent upon selling his gas and knowing human nature, the gas man claims eight to ten per cent better efficiency and maintains his claim by personally adjusting and cleaning your boiler four times a year

free of charge. And knowing human nature as I do, I must agree as to the value of this service. I have yet to meet a client of mine or an oil dealer who would do as much for his oil burner.

And finally, the gas man talks convenience.

Put to it, though, he admits that his over-all cost will be ten per cent higher than oil and that his *fuel* cost without making these adjustments may be as much as fifty per cent higher than that of oil.

There is no question in my mind as to the accuracy of the claims. There is, however, another angle to the situation.

Wasteful of fuel and heat as most of us are, our fuel bills will not be seriously increased when burning oil because the overhead is constant and the fuel cost is low. Wasteful with gas, however, you will suffer because gas depends for its economy upon a bookkeeping adjustment, a deferred payment, as it were, to be paid by the oil burner owners when and if their machines totter and fall after ten years of use.

OIL BURNERS—WHAT MAKE?

Are you a Packard addict or do you prefer Cadillacs? Whatever your choice, you no doubt have good and sufficient reasons—reasons, though, founded more on fiction than on fact because both are excellent cars—with little to choose between them.

So it is with oil burners. They vary in price from $600 to $160 but, given a list of oil burner manufacturers, I should tentatively approve them all—with one or two exceptions—because the difference between their products amounts to little more than color and shape.

The final selection of an oil burner, however, differs from that of an automobile in one great essential. We do not have anything in the oil burner field to compare with public garages or service stations,—the reason for this being that oil burners cannot be serviced at a profit, hence each burner manufacturer has to maintain a chain of dealer stations rendering service on more or less nominal terms.

Naturally, since no one is going to run these stations for love, we must understand who supports them.

An oil burner mechanism costs the dealer about $80.00—the tank and the installation another $80.00—

a total of $160.00. For this, you are charged $320.00 which leaves the dealer $160.00 to cover the losses in his service department and pay a profit.

In other words, using the terms of our politician friends, your oil burner dollar is spent as follows:

One-fourth to the manufacturer for the mechanism
One-fourth to the dealer for installation
One-fourth to the dealer for service
One-fourth to the dealer for profit.

It should be clear then that you are not paying for a mechanism alone—you are investing three times as much in installation and service. That is why oil burner associations and architects tell you to select your burner, not by the manufacturer's name, but rather on the basis of the local dealer's reputation.

CHAPTER L

DOMESTIC HOT WATER SUPPLY

Economists tell us a nation's civilization is gauged not by the writings of its authors or the songs of its musicians but by its consumption of soap, sulphuric acid, and steel. I think, however, from my personal observations that it could be more briefly and accurately stated in terms of its hot water consumption.

My own life has been punctuated by many periods. The color of each, however, has been more affected by the hot water supply of the moment than by any one other factor. Life with it is marvelous—life without it is almost unbearable. And my experience in building for others has taught me that I am not alone in this feeling.

If your house is heated by oil or by coal with an automatic stoker and the heating system is steam or hot water, the problem is simple, so simple that I personally would not bother with an auxiliary heater of any kind, no matter how cheap separate gas or electric heaters might be.

The layout of your system, probably too involved for you to handle unaided, will be made by the heating

contractor or engineer. The principle, though, is simple and should be understood by you.

The heating boiler in such a system becomes a reservoir for heat with radiators to the rooms above and a radiator, as well, to the hot water tank.

These two sets of radiators function separately. Those in the house get heat *only* when it is called for by the thermostat and the radiator to the hot water tank gets heat all the time, so long as the boiler is hot.

It only remains then to connect the oil burner to the furnace by another control called an aquastat to maintain the boiler at a constant temperature and thus maintain a reservoir of heat the year round, heat available to either channel for the asking.

The mechanism is not complicated nor expensive and, once set, requires no adjustments from season to season. Day in and day out it delivers cheap hot water and at the same time, when called for by the thermostat in the front hall, it delivers heat.

If, however, you scorn steam and hot water and take to direct fired warm air heat, your problem is more involved.

The burner of a direct warm air heating system operates necessarily only at the moment heat is required above. If the house is warm, it remains idle, consequently it can give no hot water in the spring, fall, or summer. An auxiliary hot water heater, therefore, is necessary—coal, gas, electricity, kerosene, or oil.

Of these auxiliaries, coal is the cheapest, most practical; gas, within city limits, quite satisfactory; electricity, expensive almost anywhere; kerosene, a fire

hazard; and a separate man-sized oil-burning hot water heater, cheap to operate but devilishly expensive to install.

The problem is a serious one, a phase of the warm air heating problem which is not likely to be explained in detail by the salesman but which is important enough to make me think twice before I recommend them in preference to steam or hot water heat with their automatic plentiful supply of hot water.

CHAPTER LI

THE BUDGET OR WHAT IS A BALANCED RATION?

In the diagram which forms the frontispiece, I have tried to show graphically the relative costs of the various items that go to make up a building project.

Too often, in preparing their budgets, home owners, architects, and builders think of the building as the only cost, expecting the money for finance, legal expenses and fire insurance to come out of the sky as children do, I suppose, borne by a stork.

Again, home owners, when considering the building itself, are too apt to ride a hobby to the detriment of balance in the whole.

So it might not be amiss to set forth the actual costs of a job which I believe to be in balance.

I should advise you to study this table of costs when your prices are complete and if your heating cost, for instance, is way out of line, reduce it by using a simpler, cheaper type or even shove up the other items, so that if you come to sell, you will have a normal, well-balanced house to dispose of and not an exaggerated boiler plant.

Don't let your investment in any way resemble a slapstick comedian with oversized breeches and hat.

FINAL BUDGET FOR A STONE HOUSE AND LOT

Lot, unimproved	$1450.00	
Well and Pump	747.00	
Survey	50.00	
Legal Expense connected with purchase of plot plus search	50.00	
Total Land Cost		$2297.00

FINANCE (I.E. RAISING MORTGAGE MONEY)

Appraisal Fee	$ 21.00	
Interest during construction	260.00	
Legal expense, mortgage search and recording	52.00	
Survey, locating house on plot, map for F.H.A.	15.00	
Fire Insurance	30.00	
Total Finance Cost		$ 378.00

BUILDING COST

Excavation	$150.00	
Grading and Drive	250.00	
Masonry: cellar, foundation, garage floor, terrace, masonry side walls, and plaster	1800.00	
Septic Tank or sewer connection	130.00	
Carpentry Labor, Lumber, and Rough Hardware	2050.00	
This includes:		
Kitchen Cabs. $75.00		
Medicine " 24.00		
Hardware (very simple)	75.00	
Electrical (includes service to gable)	125.00	

Electrical Fixtures (very simple)	50.00	
Plumbing, Heating, Tinning	1075.00	
Oil Burner and 275 gallon Oil Tank	300.00	
Linoleum (floors of two baths and kitchen)	130.00	
Paint	300.00	
Permits	15.00	
Total Building Cost		$6345.00
Contingent Fund		200.00
Total Cost of Project		$9220.00

. . . . . .

BUDGET FOR SAME HOUSE OF FRAME

Land Cost, Same	$2297.00	
Finance Cost, Same	378.00	
		$2675.00

BUILDING COST

Excavation, Same	150.00
Grading and Driveway	250.00
Masonry: cellar, foundation, terrace, garage floor, and plaster	950.00
Septic Tank, Same	130.00
Carpentry, Labor and Lumber	2450.00
Hardware, Same	75.00
Electrical, Same	125.00
Electrical Fixtures, Same	50.00
Plumbing, Heating, Tinning Same	1075.00
Oil Burner, Same	300.00
Linoleum, Same	130.00

Paint	380.00	
Permits, Same	15.00	
Total Building Cost		$6010.00
Contingent Fund, Same		200.00
Total Cost of Project		$8885.00

A CHECK LIST FOR PREPARING A SPECIFICATION—LEST WE FORGET

"To BE forewarned is to be forearmed."

I commend to you, therefore, the following list of contract divisions for a small house and suggest that you use it as a basis for checking or preparing the final specification.

The method of division, the headings themselves, may not be to your liking. However, this list can serve to prevent your forgetting an item that nevertheless will have to be paid for.

Under each division, the main items of work normally performed by that contractor are listed. You can, of course, switch them around. Be sure, though, when the whole is reassembled to your liking that each item is being furnished or performed by some one for a fixed sum.

Each section of the specification should be prefaced by the following brief general statement:

General

Furnish all labor, materials, and machinery necessary for the proper performance of this section of the work.

Coöperate, wherever necessary, for the proper execution of the whole job and stand prepared to make good any defects in either workmanship or materials which become evident within one year after completion of the whole.

Comply with all rules and regulations and obtain all permits required by insurance companies or state, town, or city authorities without additional charge.

On completion of his work, this contractor will be expected to remove all litter, waste or excess material, tools, etc., resulting from his section of the work.

This contractor shall maintain such insurance in approved companies as will protect him and the owner from claims for damages for personal injury, including death, which may arise from operations under this contract. Certificates of such insurance shall be filed with the owner and shall be approved by him for adequacy of protection.

Following this general clause, the specification for each contractor should contain clauses covering any of the following items having application to your job:

Septic Tank Contract

Contractor should be required to take the site as it is and be responsible for any sub-drainage found necessary.

Contractor should be required to furnish concrete tank having capacity of not less than 50 gallons per person. Number of compartments?

Contractor should be required to construct tile field having at least 50 feet of drainage tile for every person.

Grease trap?

Protection of lines if they cross roads?

Stone?

He should be required to give guarantee that system will not pollute nearby streams, will conform to health and F.H.A. requirements and will not have to be cleaned within two years if properly used.

Excavation Contract

Excavate for footings to depth of 3′6″ or to base rock. Footings to be provided for all foundation walls, terraces, steps, piers, columns, or chimneys.

Remove trees, roots, organic matter, and projecting stones within the building lines.

Remove top soil—to what depth?

Excavate for cellar or furnace pit—Size? Depth?

Construct necessary drainage lines—Where? Material and method?

Excavate for sewer? Water? Gas? Electric service?

Excavate for well pit? Oil tank? Size?

Back-fill against foundation, over drains, ditches, pits, etc., and when?

Dispose of excavated soil—how?

Dispose of débris—how?

Protect open holes, ditches, and be responsible for same.

If rock is encountered, is it to be regarded as extra? If so, at what rate, and whose measurements?

Contractor responsible for damage by blasting? Avoid joint responsibility.

Grading Contract

How much of the lot is to be graded?

Thoroughly clean grounds to be graded, before commencing work.

What are finished grade levels to be?

This contractor should spread top soil—how thick?

He should rake, roll, and seed—what area? What type grass seed?

He should nurse the lawn for what period after seeding?

Is he to apply fertilizer? If so, what and how much?

He should construct driveway. Type? Surfacing material? Length? Width? Is culvert necessary?

He should construct front and back walks. Material? Width? Length? Location?

He should construct dry wells and areaways. Where? Size? Material?

Any drainage ditches?

How shall he dispose of débris?

The Masonry Contract

Should provide for:

Construction of footings. Size? Depth? Material?

Construction of foundation walls. Size? Material?

Construction of piers or masonry columns. Size? Material?

Construction of side walls if house is masonry. Thickness? Material?

Construction of terraces and steps. Size? Material?

Laying of all masonry floors. Which? What material?

Construction of cellar drain.

Cellar windows. Type? Size?

Fireplaces. Material of chimney? Size flues and dampers? Material of hearth, fringe, inner hearth and sides? Ash dump?

Chimneys. Flue size? Material? Clean out? Thimble?

Fix responsibility for damage by frost or rain?

Owner to furnish water necessary for construction.

Mason to coöperate with carpenter in setting flashing strips and window and door frames occurring in masonry.

Reënforcing and metal lintels. Where? Size? How many?

Pump pit if necessary. Size? Type? Cover? Drain?

Are recommendations of Portland Cement Association concerned?

The Carpentry Contract

This contractor should furnish and install steel or wood floor joists and girders of size and material specified, rafters of size specified.

He should bridge all joists on spans more than 8′.

He should conform to all requirements of building code, increasing timber sizes if necessary at no extra cost.

Construct exterior frame walls as specified, if of frame, or fur masonry walls.

Cover and insulate frame exterior walls as specified and install all insulation.

Cover and insulate roof as specified.

Set all partitions.

Erect all scaffolding and forms and protect trim and cut for all trades.

Install exterior trim of material specified.

Furnish and set all window and door frames of type specified. All sash to be glazed.

Furnish and set window sash.

Furnish and hang all doors of type and thickness selected by you.

Furnish necessary rough hardware.

Set and furnish interior base and base mold.

Set and furnish door frames, stop, and trim.

Furnish and hang copper screens at all openings.

Panel any rooms indicated with type paneling selected by you.

Erect and set and furnish all stairs, rails, and balusters.

Furnish and set mantel of type indicated.

Furnish and erect all bookcases, medicine cabinets, kitchen cabinets, closet poles, shelves of type and number specified.

Furnish and lay rough and finish floors. Grade?

Set all hardware, towel bars, soap dishes, etc., furnished.

Furnish and hang any mirror doors.

Furnish and set cove or picture moldings specified.
Coöperate in setting of flashings.
Construct any dormers or bay windows shown.
Provide trap door or folding stair to attic and lay floor.
Provide for sanding of all oak floors.
Perform necessary work in preparation for tile.
Apply and furnish any composition wainscoting specified in bath or kitchen.
Furnish and install garage doors of type specified.
Furnish and install shutters.

The Plaster Contract

Should specify rooms to be plastered. Finish?
Plaster base. What material? Where should it be varied?
Are corners to be reënforced?
Lath manufacturer's directions to be followed?
Plaster materials. What make? Method of application for all types to be used?
Plaster manufacturer's directions to be followed.
Insist he patch up damaged spots after floors are laid?
If plastering is to be done in freezing weather, who is to furnish fuel? Who is to tend fires?

Finish Hardware to be Selected by Owner

Should include the following:
Exterior door locks.
Bedroom locks.
Bathroom locks.
Door hinges.

Casement hardware.
Screen hardware.
Shutter hardware.
Door bumpers.
Cabinet hardware.
Bookcase shelf holders.
Garage hardware.
Bathroom accessories, if not tile.
Double action hinges.
NOTE: If you wish exterior doors keyed in any special way, make particular mention of it.

Electric Contract

Be sure it includes the following labor and material:
Service of ample size from electric power line to meter board.
Meter board and switches.
Panel board and fuses.
Base plugs, fixture outlets, and switches for every room.
Closet lights.
Cellar and attic lights.
Garage lights.
Exterior lights.
Stove, ice box, radio, and clock outlets.
The hanging of all fixtures furnished.
The construction of pole line by power company if necessary.
Compliance with Underwriters' requirements and certificate of approval when completed.

Provide temporary service when necessary for other crafts.

Electric Fixtures

When ordering, be sure you have a carefully prepared list of all fixtures needed and be sure fixtures are completely and correctly wired, ready to hang when delivered.

They may be furnished "keyless" if they are operated by a wall switch.

The Paint Contract

Be sure it includes the decoration of all the following items and be sure type of material, number of coats and preparation prior to decoration is clearly stated for each:

Exterior trim.

Exterior side walls and roof.

Finish floors—oak, linoleum, or what have you?

Interior trim of each room.

Interior paneling.

Porch floors.

Interior plaster of each room.

Radiators and registers.

Floors inclusive of waxing.

Iron work.

Shutters.

Screens.

It should include also the proper sanding and cleaning of work before treatment.

It also should provide for the general clean up of the interior and the washing of window sash.

Replace broken window glass.

The Heating Contract

Should provide for:

Complete heating system of the type selected, inclusive of furnace, oil burner, oil tank, burner controls, radiators, registers, piping, valves, and all equipment necessary to make it function as a unit.

The capacity and installation of the system shall be in accordance with manufacturer's recommendations and guaranteed by this contractor to heat all finished rooms to 70° F. in zero weather.

Any electrical work necessary for operation of burner to be performed by this contractor.

The boiler shall show flue gas temperature not higher than 500° F. under full load, and oil burner shall be adjusted to yield CO_2 content of ten to eleven per cent.

If hot water heater is included, its type, size, etc., should be clearly stated.

Furnish heat during plastering in freezing weather.

The Plumbing Contract

Should include:

Connecting with city or town water supply and paying all fees.

The installation of a complete system in accordance with sanitary code or good practice.

Materials shall include brass pipe, extra heavy soil, and lead bends at toilets.

Fixtures shall be in accord with selection made by you at manufacturer's show room which should include fittings as well (i.e., faucets, traps, etc.).

Every fixture should be separately valved.

It should include sewer connections to a point 5′ beyond building line and installation of hose cocks.

It should include hot water storage tank properly valved.

It should include the cleaning of all fixtures.

The Sheet Metal Contract

Should include:

Flashing with sixteen ounce copper of all chimneys, valleys, dormers, window heads.

Copper leaders, gutters, and their hangers, all of size and style selected.

The Tile Contract

Should include:

The preparation and laying of floors, walls or sills with tile in rooms specified.

All material of grade and pattern selected, certified by manufacturer.

Soap dishes, towel bars, etc., as required.

The cleaning of all tile work when complete.

The protection of all fixtures, plaster, etc., while tile is being laid.

The Linoleum Contract

Should include:

The laying in accordance with Standard Specification of the Linoleum and Felt Base Manufacturers' Association

The furnishing of material of pattern and gauge specified in each room to be treated. Floors? Wall? Base?

The cleaning and waxing when done.

The owner should then determine for himself how much the following items not covered by contracts are to cost:

Towel bars, etc.
Iron rails and grilles.
Curtain rods.
Mortgage interest.
Legal advice and papers.
Survey and maps.
Fire insurance.
Recording of papers.
Plans and blueprints.

If your job is remodeling, this same list can serve in preparing the contracts, because most of these items, plus an item about the re-use of reclaimed materials and the demolition or preparation of the old for the new, are involved.

And finally, in preparing the budget, add a certain sum to the contract figures for unexpected contingencies.

If it is new construction, $200.00 will be enough. If

it is remodeling, though, increase the contingency fund to at least twenty per cent of the total estimated cost.

If, in the end, you haven't had to spend this contingent fund why then

"You're a better man than I am, Gunga Din."

CHAPTER LIII

SHIP AHOY OR WHAT SHOULD YOU DO TO KEEP IT AFLOAT?

With due respect to Henry Ford, he has not yet designed a new car that didn't show need for changes and "fixin's" here and there when it finally was built and tested. And that—after the dozens of models and millions of cars designed, built, and serviced by his immense organization.

Yet when this house of yours is finished, you are going to expect perfection and may possibly be very hurt when you find that the impossible has not been achieved.

Perhaps you will visit your neighbors' houses for comparison and find the shortcomings of your house lacking in theirs and wonder—forgetting, of course, that your friends may have had two or three years in which to correct these shortcomings.

Houses, like children, have growing pains. Like ships newly built and tightly riveted, they must find themselves before they finally settle down to the humdrum business of housing you day in and day out.

When the heat goes on, the joists and studs must shrink and the floor must curl a bit. This puts unex-

pected strains on certain points, which start a new set of groans and sighs until the whole takes a final set.

When summer comes, the joists and studs lift again but more directly. The nails and cleats have been loosened, consequently the process is quieter and without any new unexpected results.

I go into this at some length because no matter how well you build, you are bound at the end of the first year to have a certain number of plaster cracks and a few warped doors. Repair or replace them at the end of the heating season, though, and they are not likely to recur.

But besides these more serious repairs, you are going to have other minor troubles in the first year, troubles with which even the best builders are afflicted and troubles which cannot very well be avoided.

You may, for instance, find during the spring that your cellar walls are not entirely tight. If so, call in your mason and have the holes plugged. If the leakage is too great, install a sump pump, remembering that you should have done that in the first place.

Undoubtedly your terrace floor will crack. That is merely nature's method of providing expansion joints.

After the first severe east storm—the christening, as I call it—your house will develop a leak or two. Mark them carefully and have the tinner and the mason correct them.

No doubt the faucets will develop irritating drips at the end of the first week. That doesn't mean cheap material but merely indicates sand has lodged in the valve washers. Have the plumber clean them out.

Perhaps you will be upset by the peeling of enameled paint or by the very evident bleaching of paper laid on white plaster. This indicates that the plaster was too green or not entirely dry when it was decorated. The painter should make the necessary repairs. But wait now two or three months for the aging process to reach completion.

Or perhaps the grain on one or two doors will begin to work through the paint. This is caused by unusually "sappy" grain. It could have been prevented had you specified a priming coat of shellac on all woodwork.

If your house is of whitewashed masonry the whitewash may commerce to peel in a few spots. If so, prime these spots with aluminum paint before they are touched up.

Maybe your oil bill seems high the first few months. Remember, though, that the oil in your tank has still to be burned.

In the first month or two your burner may "act up." Don't get excited. Give the service man a chance to get it adjusted.

If at the end of two months or so you fail to get hot water, flush out the heating coil; and if your plumber failed to provide convenient valves for this purpose, have them added and make this a regular quarterly job.

At the end of two years, have the septic tank cleaned before sewage backs up into the laundry tubs.

If you have a slate roof, expect a few slates to crack and drop off during the first year. Your contract should have provided for their replacement.

And if you have no conditioning apparatus, expect to

find your floors and doors shrinking. At that point, get busy with pans and sprays of water, remembering ten to twelve gallons of water should be added to the atmosphere of your house daily to keep it healthy for either yourself or the house.

Just why a list of this kind should upset home owners as it does, I do not know. It seems to them an admission of defeat by the building fraternity in general. On delivery of the house, they expect somehow to get aboard and ride without so much as once lifting the hood to see that the wheels are oiled.

They think it is terrible that the motor of an oil burner must be oiled once a year. These same people, though, given an automobile, inquire daily of his temperature, wipe him dry if he gets wet, cover him when it snows, maybe shed their very coats to warm his nose, and resuscitate him with alcohol when he freezes. Is that justice?

THE DARK HORSES OF THE FUTURE—STEEL AND CONCRETE

I GUESS I am a born match-maker, always interesting myself in pretty romances and soft music.

Romances, however, are very often productive, more often in fact than not.

My romance of the moment is to join the hands of steel with concrete. Together, they could beat this game. Despite my best efforts, though, they persist in continuing along the lonely road of spinstership, hoping through divine help, I suppose, to finally bring forth prodigies of their own—though what they will look like God only knows!

Concrete, as I have explained, is a grand material with which to build your side walls, very little more expensive than wood and far superior.

But building concrete walls without fireproof floor joists and floors is akin to a wedding without a bride—or a bottle and no corkscrew.

Now fireproof floors if you wish them can be had easily and cheaply. The steel companies stand prepared to furnish special residential joists for the small home.

More interested, however, in skyscrapers, railroads,

and W.P.A. bridges, the steel companies don't push steel joists as they might. So there it stands. They can be had at a reasonable cost for the asking. Since they are out of routine, however, not so simple to order nor so cheap to buy as wood joists, the usual builder hesitates.

And right next to the steel man stands the other beneficiary—if and when the idea of permanent construction is put over—: cement.

Concrete is ideally suited to carry large compressive loads but is not so well adapted as steel to tensile strain.

It is a grand material backed by a bunch of rightfully enthusiastic salesmen, who, however, in their enthusiasm forget that sometimes more is gained by courteous coöperation than by hogging or trying to hog the whole road.

Result—the cement people, instead of pushing their own product indirectly by aiding in the distribution of steel joists, which are in production, reasonable in cost, and easy to ship, persist in dividing the field by urging the use of concrete beams available in only a few parts of the country and then only from plants with small and doubtful production.

With the two divided, no one gets anywhere except the lumber dealer, who stands prepared on thirty minutes' notice to furnish all the wood joists one's heart might desire.

If you intend to build for permanence, though, of concrete or stone, I suggest patience.

Submit your plans to the local steel mill, ask for a layout and price on steel joists throughout.

Compare this price with its equivalent in wood joists. And, if possible, follow through. You will profit not only in a saving in fire insurance and in reduced plaster cracks, but your house will be sound proof—to say nothing of the intense personal pleasure gained from owning something that will stand without "hitching" while you continue in the pursuit of life and happiness.

Do this and your house will not be orphaned when my match-making proclivities have borne fruit—assuming, of course, that steel in the meantime does not tire of concrete's high-handed independence and wed glass instead.

CHAPTER LV

THE HOUSE OF THE FUTURE

When they come to plan their homes, a great many people philosophize on what the future holds and on just how the houses of today will be affected by it.

This, of course, is a problem which causes architects and builders many sleepless nights, which makes them wonder whether forces are not now in motion which eventually will put them on the bread line or in a factory tightening bolt No. 6347 H on the left front wheel of a trailer, or, on the other hand, detailing a kitchen sink to be repeated seven thousand times in the latest Federal Housing project in Podunk, Wisconsin.

I have given much thought to the subject but find that my conclusions are colored by the mood of the moment. The reason for this uncertainty is that there are several different forces at work, social, industrial, and mechanical. No *one* controls and yet all have their effects and counter-effects, and, given a certain sequence of events, any one might become dominant and change the whole aspect.

For instance, while some of us are moving from the city, fighting for an independent existence, certain others are going in the reverse direction.

Whilst some of us are fighting fascism and communism, others seek the protective irresponsible regimented life under a dictatorship.

While some seek quiet and rest in the country, others are attracted like moths to a flame by the new barrack-like model apartments with their convenient washing machines and nearby movies and subways, where life is automatic and where, when you get the swing of the regimented goose step, it is simpler. Why, in these apartments, even the garbage is collected in time and according to a system.

However, counter to this tendency, is the irresponsible nomadic life of the trailer tramp.

Just how far this will go no one knows. Its possibilities, however, are enormous.

Now, for instance, we hear complaints about the taxes in certain localities. Difficult to avoid them when your house is firmly anchored to the township, not so difficult when a gallon of gas will carry it to a more reasonable locality.

In the last war, draft dodgers were hard to catch. Imagine, though, a war ten years from now with our population, in trailers, surging over the country, maybe out of the country, ahead of the recruiting officer.

And finally in this picture we have labor, limited to low wages or riveted to a non-productive farm in the past by the inability to move, able by the aid of the trailer to go where life at the moment is most productive and comfortable.

And there is yet another set of forces encouraging the

building of complete, independent lives in small self-sufficient homes.

In the past, engineering has forced man to congregate in cities for mass comforts. Now, though, engineering is concentrating its attention upon making each of us able to enjoy the same comforts in even the most isolated spots.

While the trailer is emancipating us from the ground, another development of the engineer is preparing to anchor us even more permanently to it.

While one group denounces the land as not useful for anything but roads, another group is developing a machine which, without the aid of coal or oil, will heat the home from coils buried in the earth itself.

The picture then is not clear. No one can predict what or where our homes will be or what they will look like.

Personally, I detest regimentation and abhor only slightly less the idea of life on a basis of "here today, gone tomorrow." Naturally I like to accent and aid the forces working towards permanence and decentralization, and am probably not to be trusted as a prophet. But though I may lose in the end with my old-fashioned house, I still smile when I think that the trailer tramps of the future may have to stop before it, asking for a drink of water or a wind-fallen apple as they wend the dusty road to nowhere.

IN CONCLUSION

By now you should be convinced that it is entirely possible for you, aided by all the existing free agencies, to build or buy a home quite as sturdy as that which the average architect can build for you.

You should also realize, though, that life while you are doing this is going to be rather involved, a little hectic.

The process is not to be recommended to those with neurotic temperaments or weak hearts or to high-powered executives able to earn more by applying themselves more diligently to the task of "Button? button? who's got the button?"

But to those of you, poetry and Pollyanna to the contrary, to whom "time is not money," who by necessity not choice are compelled to buy or build without benefit of architect, I wish to issue a final note of caution.

An architect in return for his living makes certain physical contributions to society represented by homes, office buildings, and car barns. And as though for good measure, and according to his ability, he in addition imbues the car barn or office building with a spirit.

Your general contractor, the building inspector, and

the heating engineers, among them, I admit, can build you an "A 1" house that will stand and wear well. It will stand and wear, however, with the frigid stance and silly smile of a dummy.

This can be avoided only by your engaging an architect to draw the plans or by carefully selecting stock plans, and by sheer force of affection.

I don't know just how you will go about it. Don't think for one moment, however, that, because you have learned how to assure yourself of a good plumbing job, you have found a substitute for the architect.

Rain still is more effective than a lawn spray, and a trip to Europe a little more satisfying than a travel book.

INDEX

Air-conditioning, cost of, 152, 165; summer, 152; winter, 154, 157
Aluminum foil, 97
Alterations, 11, 25, 90, 98, 192
Appraisal fee, 6, 178
Aquastat, 175
Asbestos, shingles, 96; tile, 133
Asphalt, shingles, 96; tile, 115
Attorney, 22, 57, 62, 178, 192

Back draft, 83
Banks, inspector, 65; mortgage, 6
Base, board, 108; plaster, 127, 187; plugs, 138
Bath (*see* Plumbing)
Bathroom finish, 115, 132, 141
Bluestone floors, 85
Bookcases, 112
Bracing, 88
Brass pipe, 147
Brick, buildings, 75; fire, 84; floors, 85; substitute, 81
Broker, mortgage, 6; real estate, 25
Budget, building (*see* Cost); personal, 5, 9
Burners, oil, 155, 165, 169, 172, 174, 179, 190, 196

Cabinets, 112, 113, 178, 186
Carpet, 116
Carpentry, accessories, 112, 178, 185; cost, 108, 178; frame, 87; trim, 90, 106, 108, 141; specification, 185
Casements (*see* Windows)
Cedar, 90
Cellar, drain, 183, 195; material, 71, 80, 184; size, 69, 183, 184
Cement (*see* Concrete)
Cesspools, 39
Chestnut, 90
Chimney, 82, 185
Coal, 169, 175
Code, 65, 130, 140, 147, 185
Compensation insurance, 182
Conditioning, air-, 152, 154, 157, 165
Concrete, blocks, 72, 75; buildings, 72, 80, 122, 198; cellar, 71, 80; construction, 198; floors, 81, 85, 122; forms, 186; joists, 198; mixture, 81; ready-mix, 81; septic tanks, 45; termite resistant, 102

Contingent fund, 179, 192
Contract, building, 8, 53, 57, 60, 63, 181; land, 22

Contractor, general, 53
Copper, flashing, 89, 150, 191; gutters, 150, 191; insulation, 97; leaders, 150, 191; roofs, 96; termite resistant, 103
Cost, air-conditioning, 153, 165; cabinets, 112, 113, 178; carpentry, 178; electric, 27, 179; electric fixtures, 139; excavation, 179; finance, 179; floors, 85, 115; fuel, 169; grading, 178; hardware, 124, 178; heating system, 165, 179; hot water, 174 ; insurance, 178, 192; land, 4, 9, 24, 178; linoleum, 115, 179; masonry, 77, 85, 178; mortgages, 6, 178, 192; oil burner, 172, 179; outside shell, 77; paint, 179; plaster, 128; plumbing, 179; pump, 34; pre-fabricated, 14; remodeling, 11; roofs, 95; septic tank, 40, 178; steel sash, 104; survey, 24; tinning, 179; trailers, 14; wall coverings, 132; water, 28, 185; wells, 29; windows, 104
Cracks, 88, 107, 116, 156, 200
Cypress, 90

Deed, 24
Deep well, 31, 35
Door, frames, 91, 186; locks, 125
Doors, 186
Draft, 83
Drains, 24, 183
Driveway, 184
Dry wells, 184

Electric, fixtures, 139; heat, 169; hot water heaters, 175; line extension, 25, 26; service, 138, 188; wiring, 137, 188
Encroachments, 24
Excavation, 183

Fabricated buildings, 14
Federal Housing Act, 6, 42, 50, 65, 67, 183
Fee appraisal, 6, 178
Fireplace, 82
Fire insurance, 178
Fireproof, 75, 82, 96, 129
Firestopping, 89
Fir, 90
Fir floors, 115
Fire brick, 84
Fixtures, electrical, 139, 179; plumbing, 147
Flashing, 89
Flagg masonry, 76
Floor joists, 87, 185, 194
Floors, asphalt tile, 115; bluestone, 85; brick, 85; carpet, 115; concrete, 75, 85; cost, 85, 115; linoleum, 115, 192; masonry, 185; rubber, 115; slate, 85; staining, 143; tile, 85, 191; wood, 115, 186
Flues, 82
Footings, 183
Forms, concrete, 186
Forms, contract, 57
Foundation, 184
Frames, 91, 104, 108, 186
Fuel, 169
Furring, 186

Gas, fuel, 169; hot water heater, 175; main extension, 26
General contractor, 53
Glass, breakage, 190; cleaning, 190; wall covering, 133
Grading, 67, 184
Grease, 41, 44, 182
Gypsum, lath, 129; plaster, 130
Gutters, 150

Hardware, 124, 178, 186, 188
Heaters, hot water, 174, 196
Heating systems, 69, 155, 157, 172, 174, 176
Houses of Stone, 50, 74
Humidifier, 154, 157

Income, personal, 5
Insulation, 89, 97, 128, 186
Inspector, 50, 65, 81, 140, 148
Insurance, compensation, 182; fire, 178; mortgage, 7
Interest rate, 6
Iron roofs, 96

Joists, concrete, 198; steel, 75, 122, 185, 198; wood, 75, 87, 185, 194, 199

Kerosene heater, 174
Kitchen, cabinets, 113, 178, 186; walls, 132, 187

Land, 4, 7, 9, 17, 22, 26
Loans, mortgage, 6
Latches, 125
Law, lien, 62
Lath, 89, 128, 187
Lead roofs, 96
Leaders, 150
Legal advice, 22, 57, 62, 178, 192
Liens, 62
Lintels, 185
Locks, 125
Lot, 17, 28
Linoleum, 115, 133, 179, 192

Map, plot, 7, 23
Mantels, 112
Maintenance, 194
Masonry, buildings, 75, 122; floors, 85, 122; supervision, 80; specification, 184
Mechanic liens, 62
Metal, insulation, 97; lath, 89, 129; roof, 96; septic tanks, 45; sheet, 150, 191; tile, 133
Mineral wool, 97, 122
Mixture, concrete, 81
Mortar, 81
Mirror insulation, 97
Mortgages, 5, 6, 9, 61, 65, 192

Oak, 91, 115
Oil burner, 155, 169, 172, 174, 179, 190, 196

Paint, 106, 132, 141, 179, 189, 196
Paper, 110, 132, 141
Payments, contractor, 60, 63; land, 24; mortgage, 61
Permits, 50, 179, 182
Pine, 90, 104, 115
Pipe, 147
Plans, 3, 7, 48
Planting, 67

Plaster, base, 127, 187; board, 129; cost, 127; cracks, 88, 156, 200; decoration, 132, 143, 189; finish, 130, 187; mixture, 130, 187
Plate glass, 133
Plot, 17, 28
Plumbing, 147, 179, 190, 195
Portland Cement Association, 81, 185
Pre-fabricated buildings, 14
Public utilities, 26
Pump pit, 185
Pumps, 34
Purchase contract, 22

Quilt insulation, 97, 122

Radiation, 164
Radiator conditioning, 154
Rafters, 75, 85
Ready-mix concrete, 80
Real estate broker, 25
Reënforcing, concrete, 185; plaster, 129
Remodeling, 11, 25, 90, 98, 192
Repairs, 194
Restrictions, 24
Rights of way, 25
Roads, 25
Roof, 92, 98, 186
Rot, 90, 104
Rubber floors, 115

Sand finish, 130
Sash, 104, 186
Scaffolding, 186
Screens, 186
Septic tank, 39, 182, 186
Service, electric, 135
Sewers, 24, 26, 183
Shallow wells, 30
Sheet metal, 150, 179, 191
Shell, 77
Shingles (*see* Roofing)
Shrinkage, 88, 117, 156
Slate, floor, 85; roof, 96, 196
Smoky fireplace, 83
Soil pipe, 147
Sound proof, 121
Specification, 58, 118, 148, 182
Stain, 107, 141
Stairs, 186
Steam heat, 157, 174
"Standard," 118, 147
Steel girders, 89, 186; joists, 75, 122, 186, 198; sash, 75, 104; septic tanks, 45
Stoker, 169
Stone, houses of, 50, 74; masonry, 81
Stucco, 89
Studio ceiling, 110
Studs, 87
Suction pumps, 34
Summer conditioning, 152
Surface wells, 30
Survey, plot, 7, 23

Tanks, oil, 190; septic, 39, 182; water, 37, 183
Termites, 75, 102
Terraces, 85, 183, 195
Thumb latches, 125
Timber sizes, 87
Throat, fireplace, 83
Tile, field, 41; floors, 85, 115, 191; roofs, 96
Tinner, 150
Traps, 44, 147, 183

Trailers, 14
Trim, 90, 106, 141, 186

Underwriters, 140, 188
Utilities, public, 25, 26

Valves, plumbing, 149, 195; vacuum, 164
Veneer, 76, 89

Walks, 184
Wall covering, 128, 132
Wall board, 98, 128
Warm air heat, 155, 157, 176
Warping doors, 141
Waterproofing, 141, 195
Water, construction, 185; extension, 26; pumps, 34; proofing, 75; service, 25; well, 29, 35, 42; tank, 37, 183
Waiver of lien, 64
Wells, 29, 36, 42
White coat, 130
Wide floors, 116
Windows, 91, 104, 186
Winter conditioning, 154
Wood, entrances, 91; fiber board, 98, 128; floors, 115; joists, 75, 87, 185, 199; lath, 128; sash, 91, 104; shingles, 96
Wool insulation, 97, 122